



Energy Assessment and Analysis Methodology

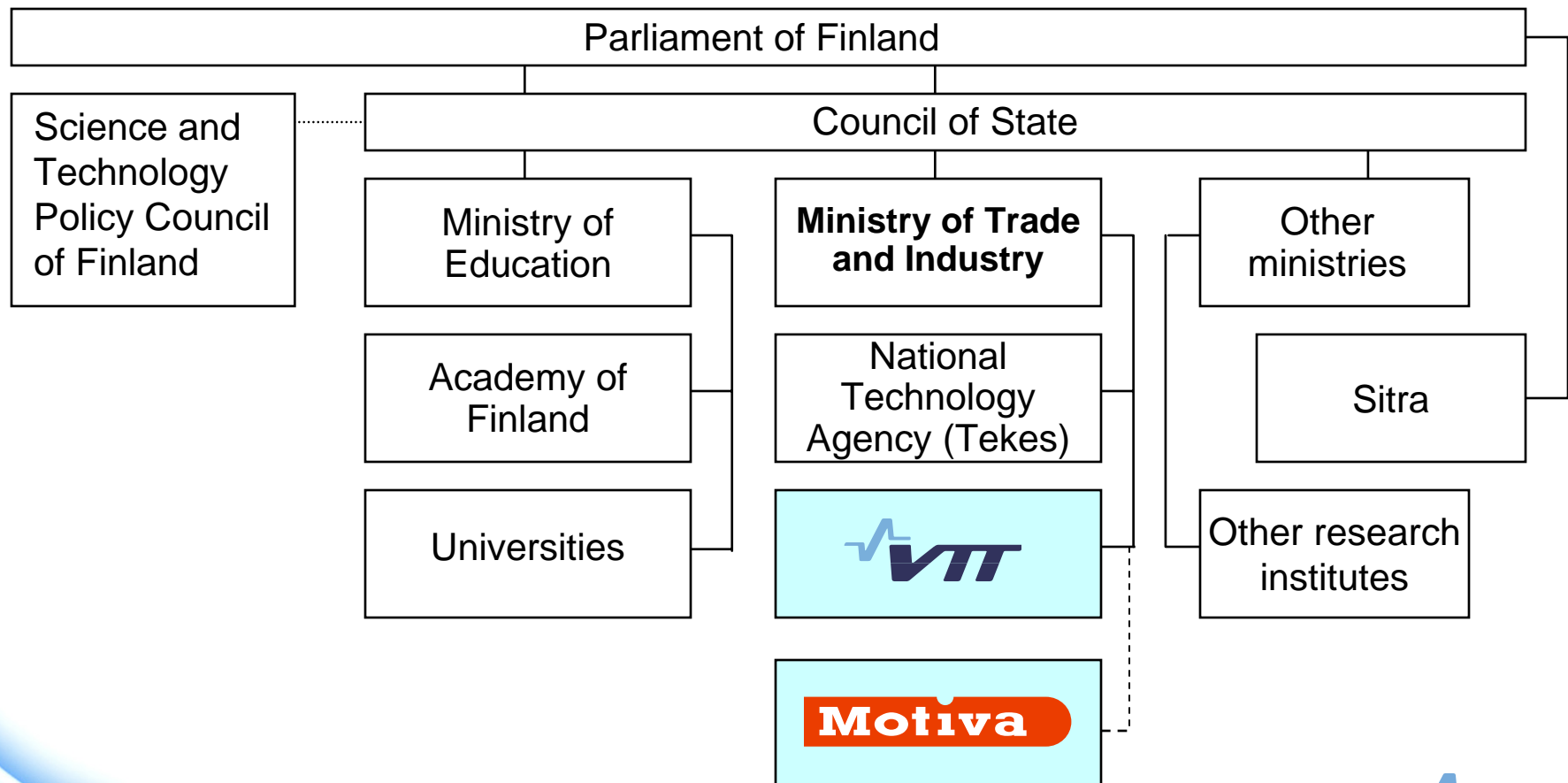
"Energy Assessment Guide for Energy Managers and ESCOs"

Overview of the Subtask A Scope

Jorma Pietiläinen



THE MOST IMPORTANT DECISION MAKERS, FINANCERS AND PERFORMERS OF RESEARCH IN THE PUBLIC SECTOR



VTT IN BRIEF

Units:

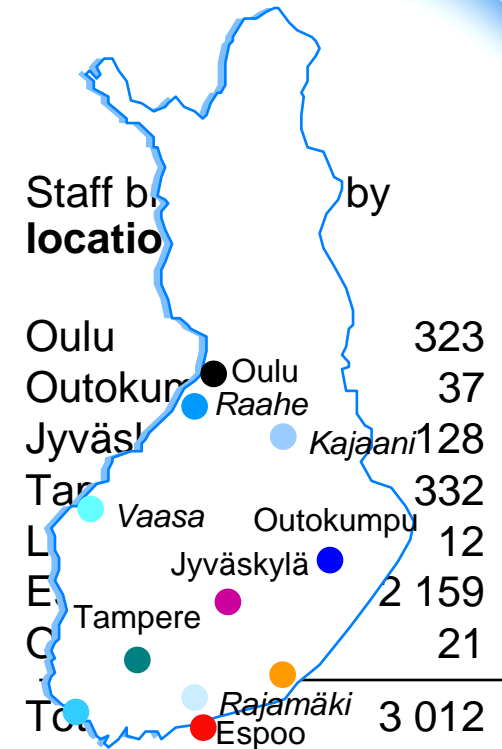
VTT Electronics
 VTT Information Technology
 VTT Industrial Systems
 VTT Processes
 VTT Biotechnology
VTT Building and Transport

VTT Information Service
 VTT Corporate Management
 and Services

Staff: 3 012

Turnover: 214 M€

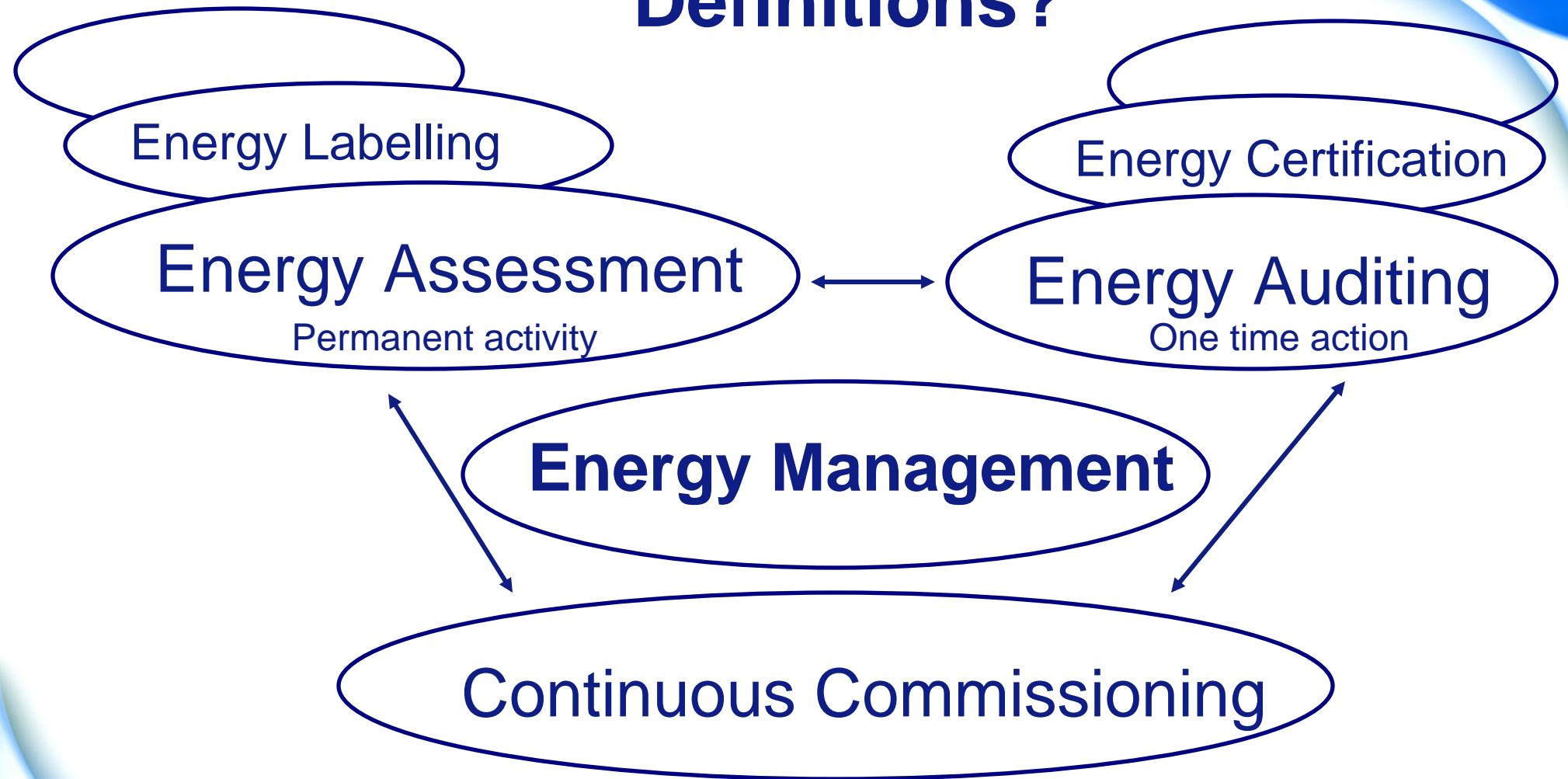
- Basic govern. funding to R&D on VTT's own initiative 34 M€
- Jointly funded projects 92 M€
- Commercial activities 88 M€



Objectives of Annex46

- **To provide tools and guidelines** for decisionmakers and energy managers, performance contractors and designers
- To improve the working environment
- To provide **recommendations on how to operate** the retrofitted buildings
- To promote energy- and cost-efficient retrofit measures by **providing successful examples**
- To support decisionmakers in **evaluating the efficiency** and acceptance of available concepts
- To find improved ways of using Energy Performance Contracts (ESPCs) for Government buildings retrofit measures

Definitions?

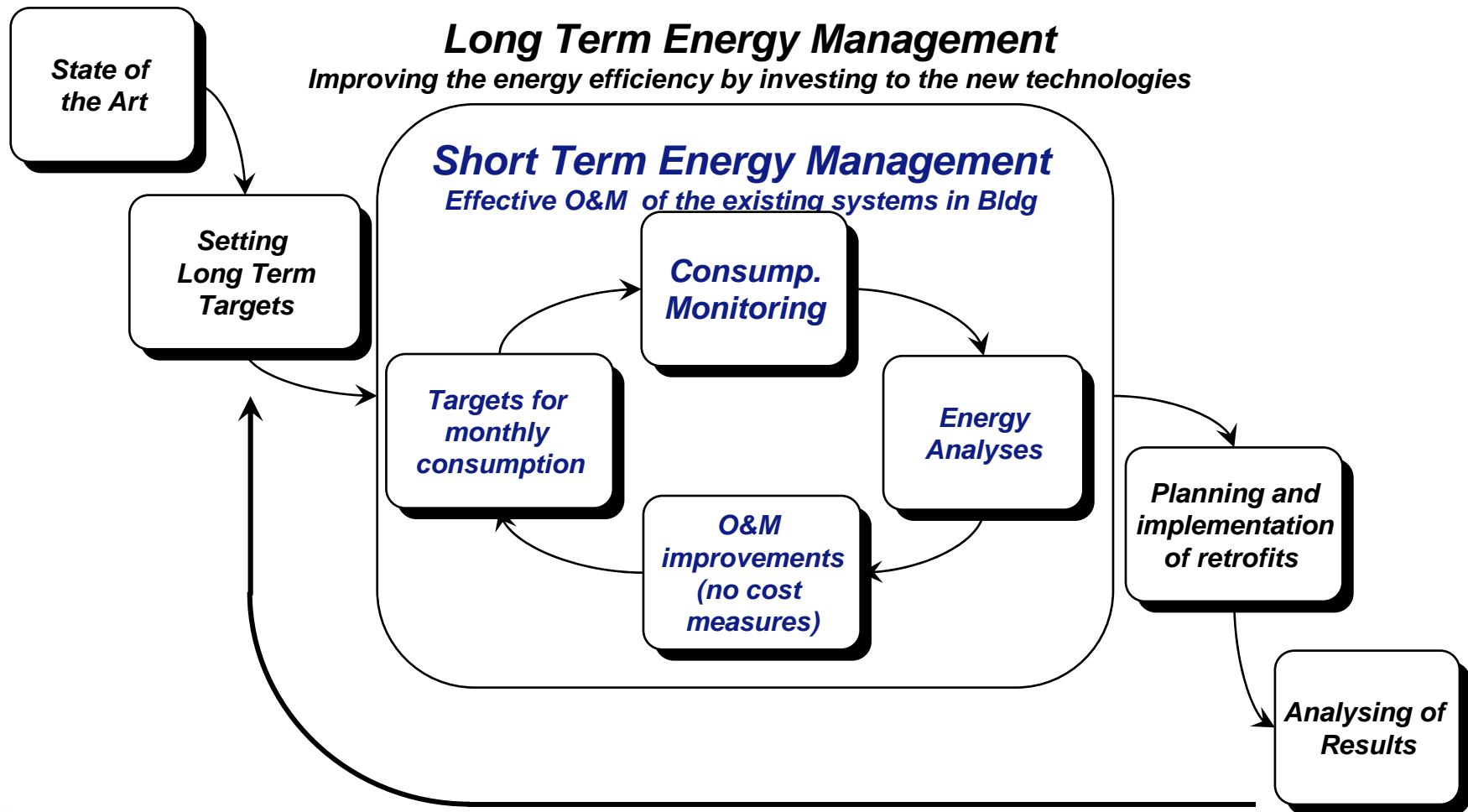


- IEA Annex4x: Cost-Effective Commissioning for Existing and Low Energy Buildings

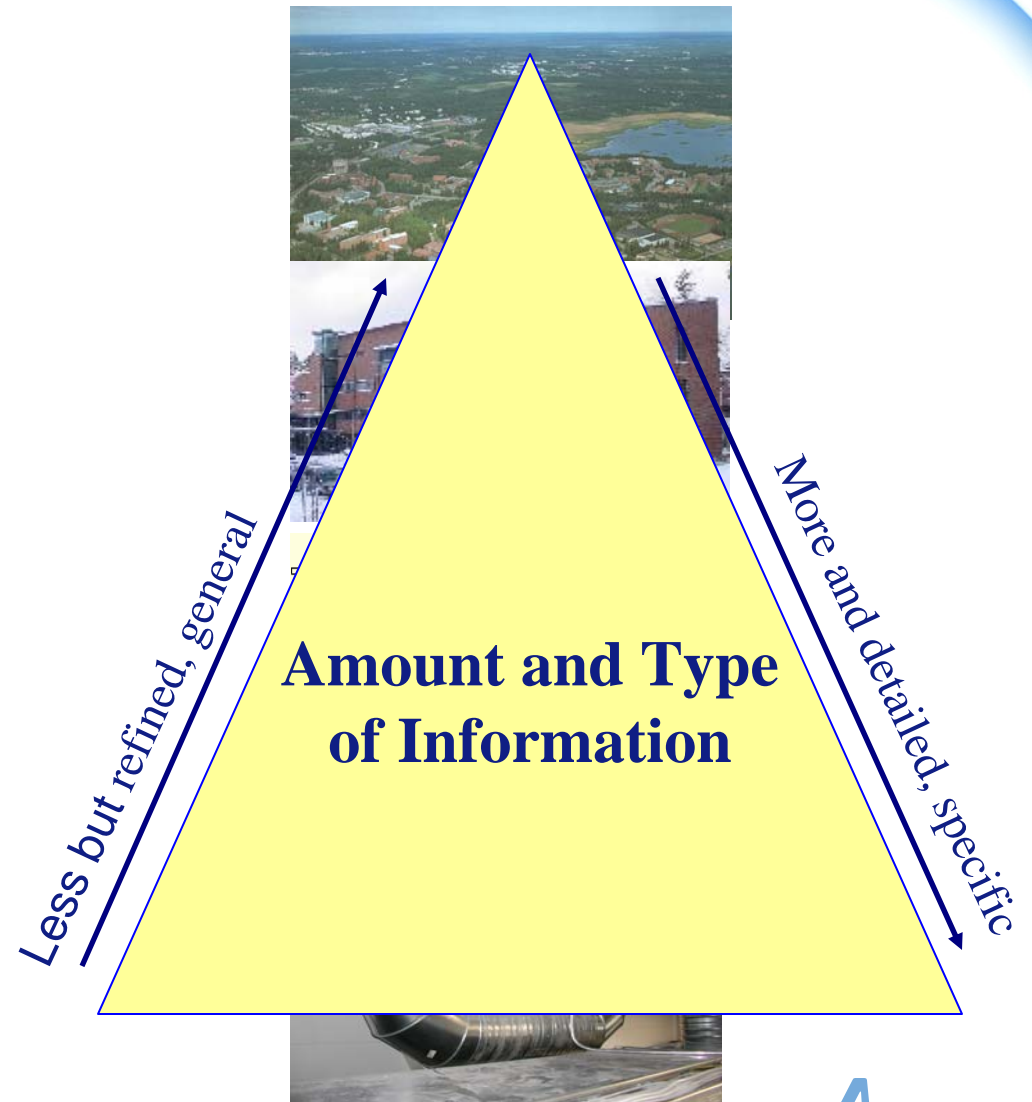
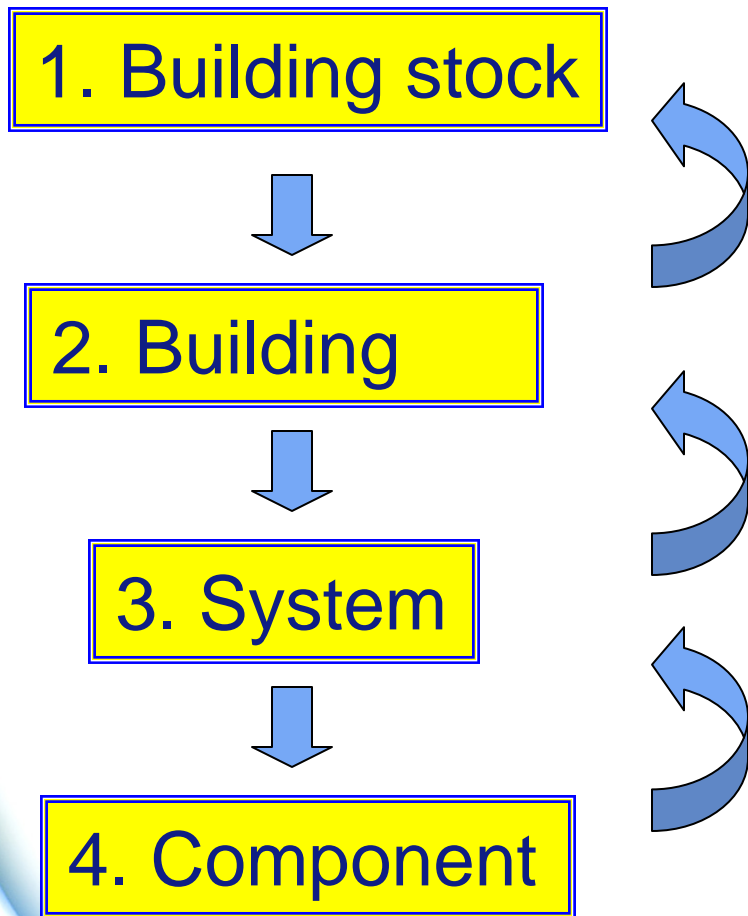
Focus of Subtask A

- ▶ Energy Assessment in Government non-residential buildings \approx Energy Auditing?
- ▶ EA-Tools for decision making process of energy retrofitting \approx Energy Management tools?
 - ▶ common procedures and guides
 - ▶ common software and other tools

Energy Management Strategies



Different levels of EA



Some typical risks in EA

- Lack of wholeness and general view
- Instead of big picture focus only on some systems or equipments
- Suboptimisation
- We don't see the wood for the trees or buildigstock/buildings for the gadgets

Tools of EA:

L1. Building stock



L2. Building



L3. System

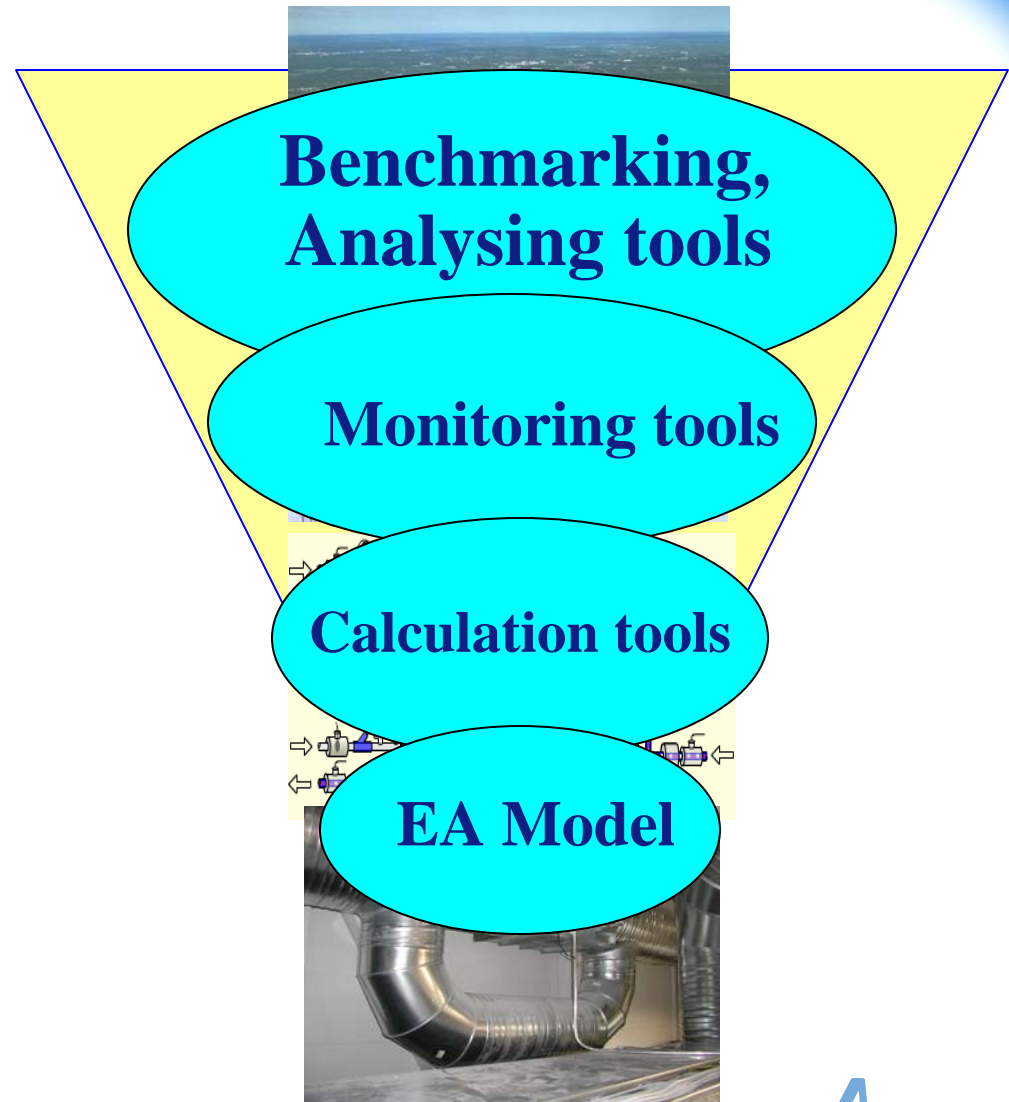
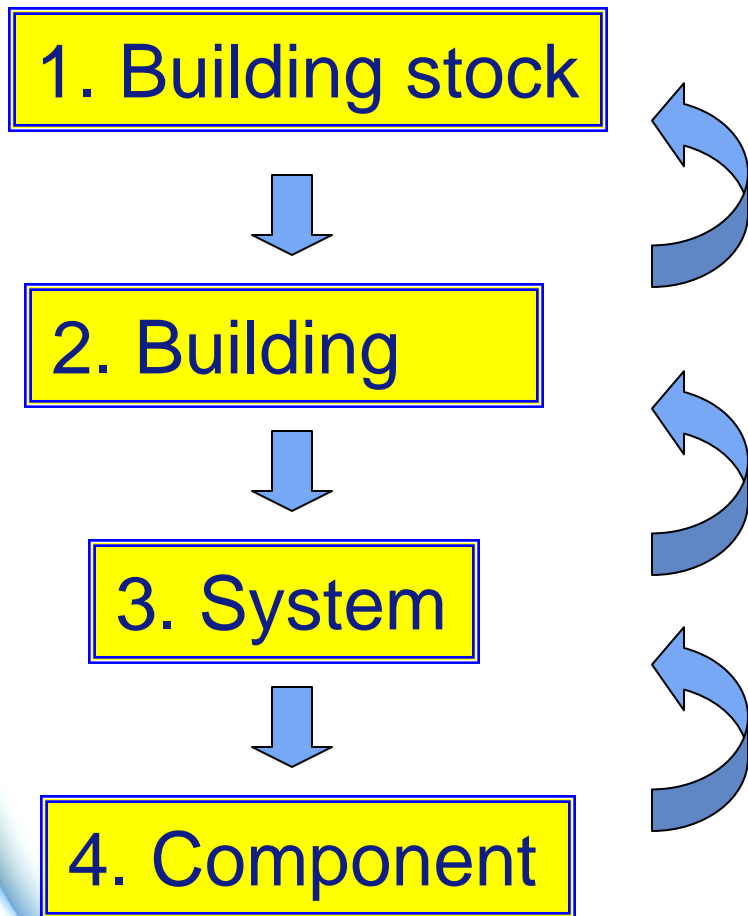


L4. Component



Monitoring	Calculation	Other
Building stock		
Building		
System		
Component		

Focus of EA (Subtask A):



Focus of subtask A

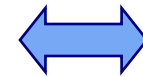
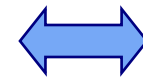
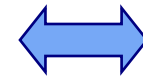
Monitoring, Targeting and Benchmarking Tools



Calculation method and tools (common simple sw?)



Energy Assessment/Audit Model (incl. guidebook, checklists etc.)

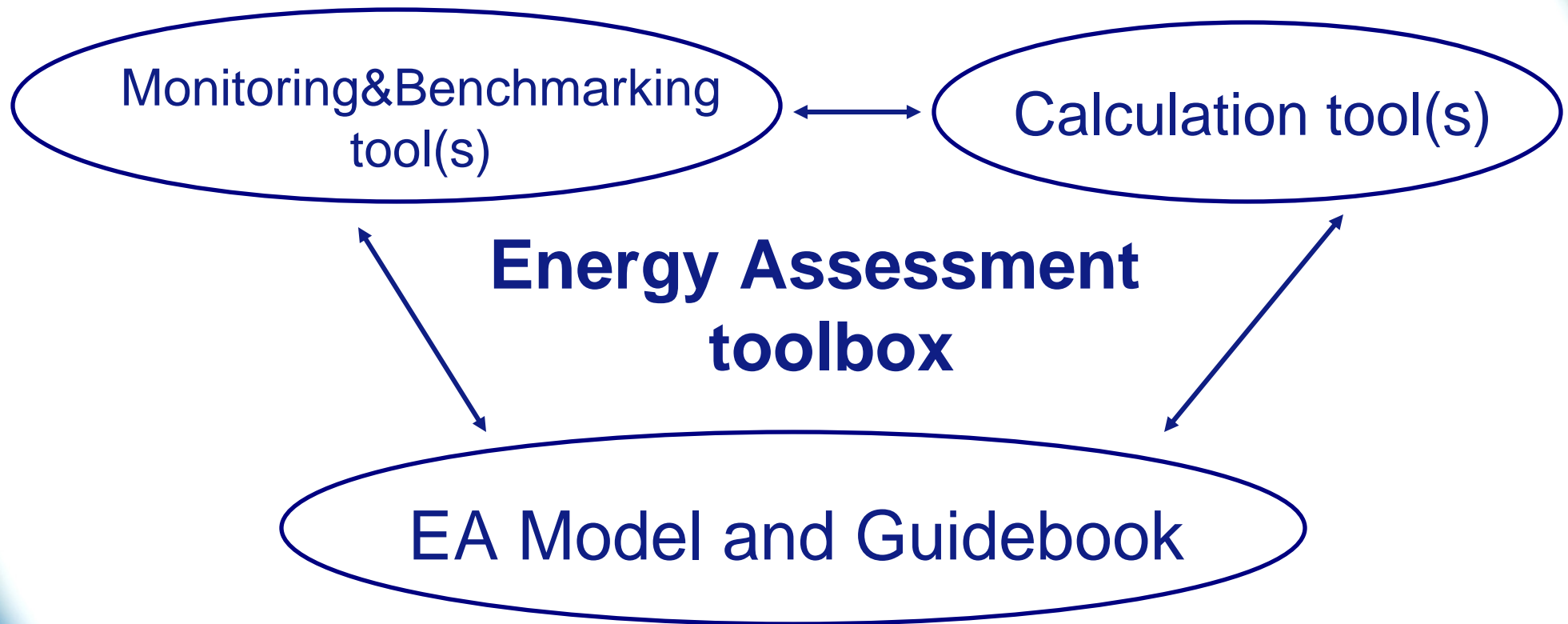


Testing the tools in pilot buildings (buildingstocks)

Tasks

- A1 Mapping out useful existing materials and experiences
Analysing of present tools and (best) practices
- A2 Developing a www-based monitoring&targeting platform for EA
Setting up a pilot benchmarking sytem (incl pilot bldg-stocks)
- A3 Developing simple calculation toolset for EA
(Testing it in pilot audits in pilot buildings?)
- A4 Developing a common EA model incl. guidebook
(Testing it = Implementing pilot audits in pilot buildings?)
- A5 Integrating the outputs with the other subtasks (especially D)
Reporting and dissemination activities

Subtask A Deliverables?



Working Principle

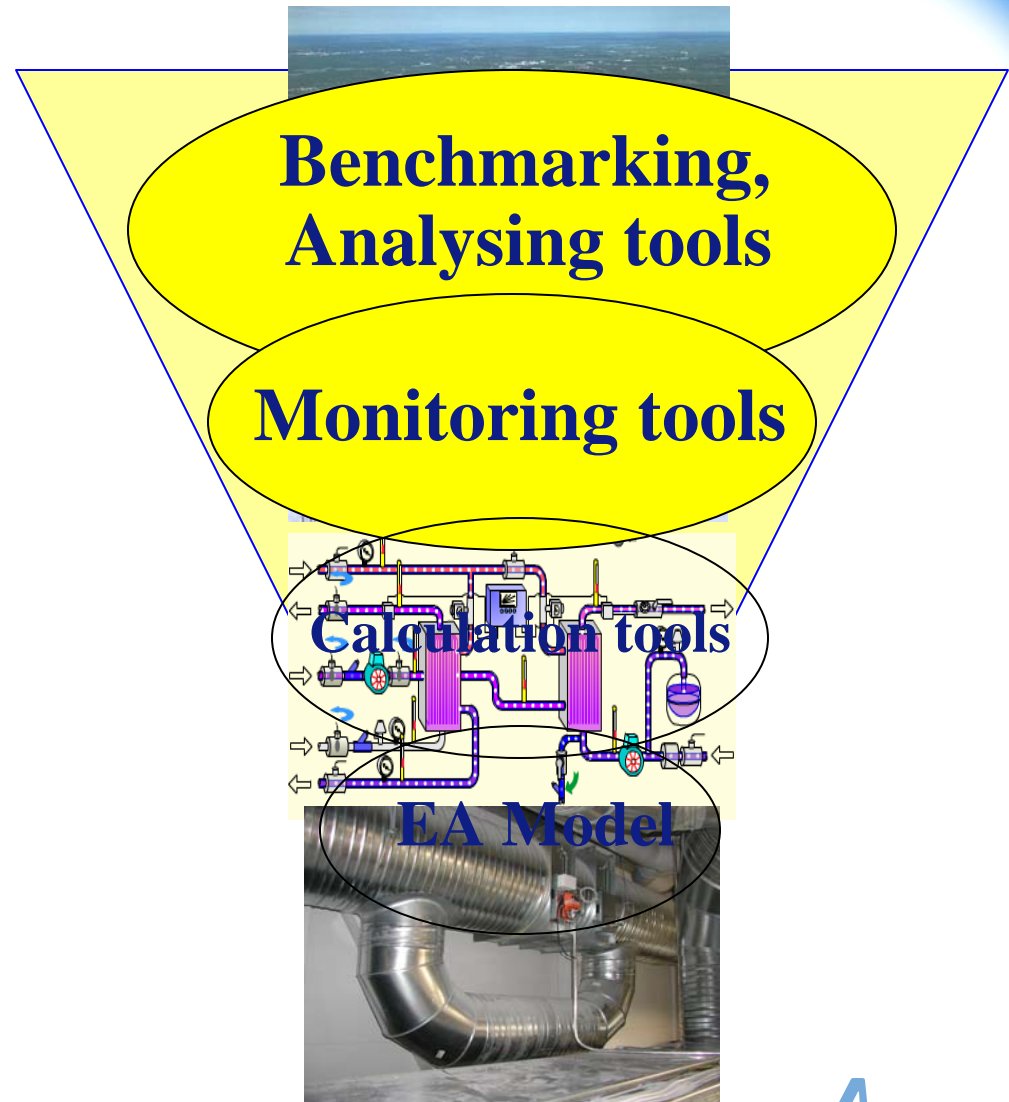
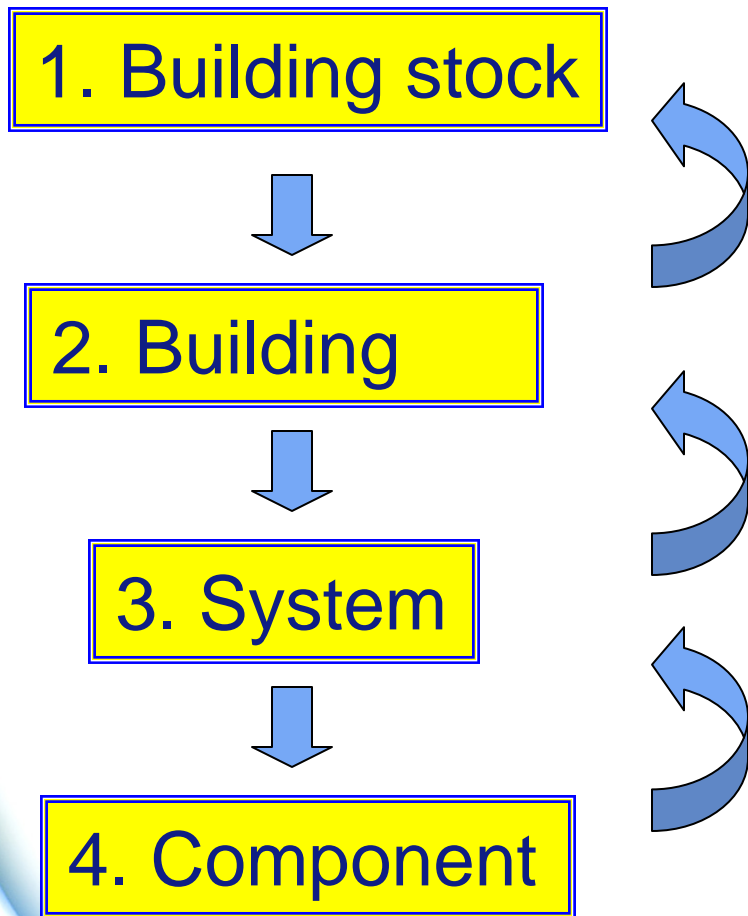
We **don't** have to

- **start from scratch!**
- **re-invent the wheel!**

**A lot of knowledge and
experience is available!**

Some examples:

Examples of EA Tools:





Monitoring tools developed at VTT:

⇒ Monitoring & Targeting

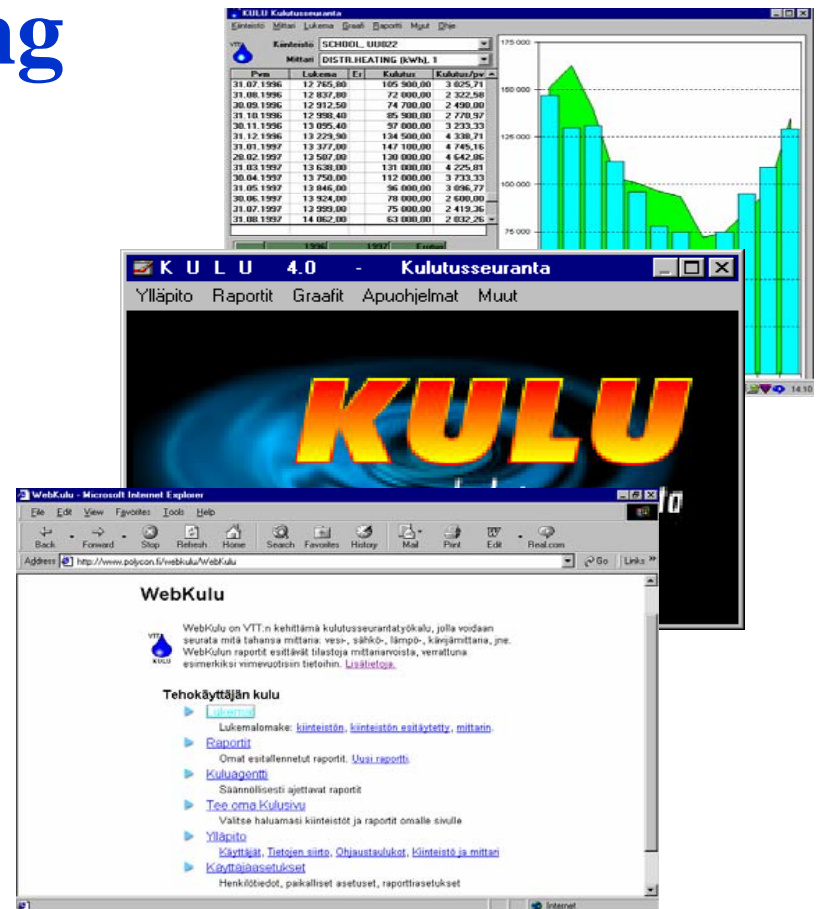
⇒ Energy Management

⇒ Analysing

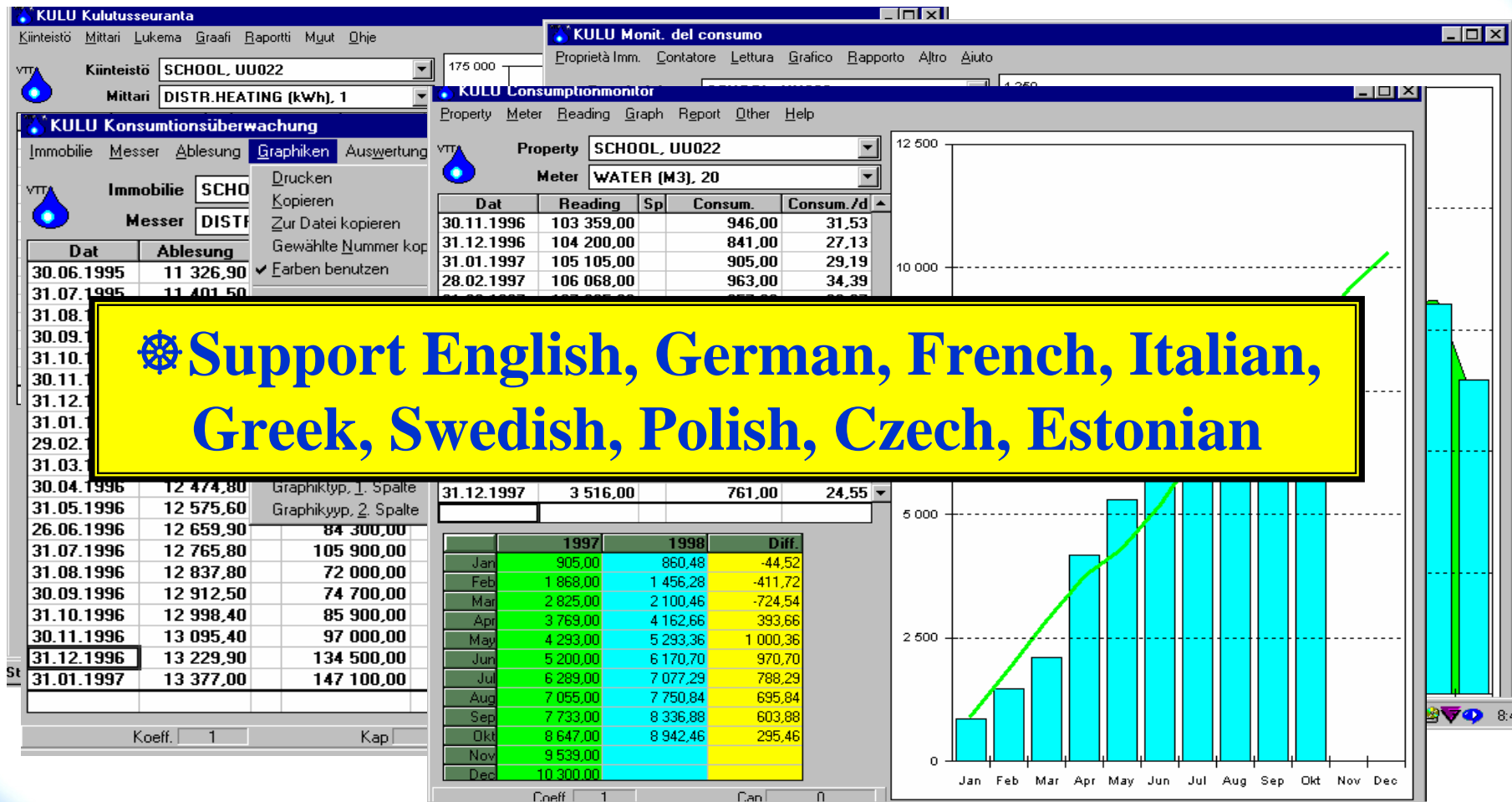
⇒ Benchmarking

⇒ Feedback

⇒ Motivation

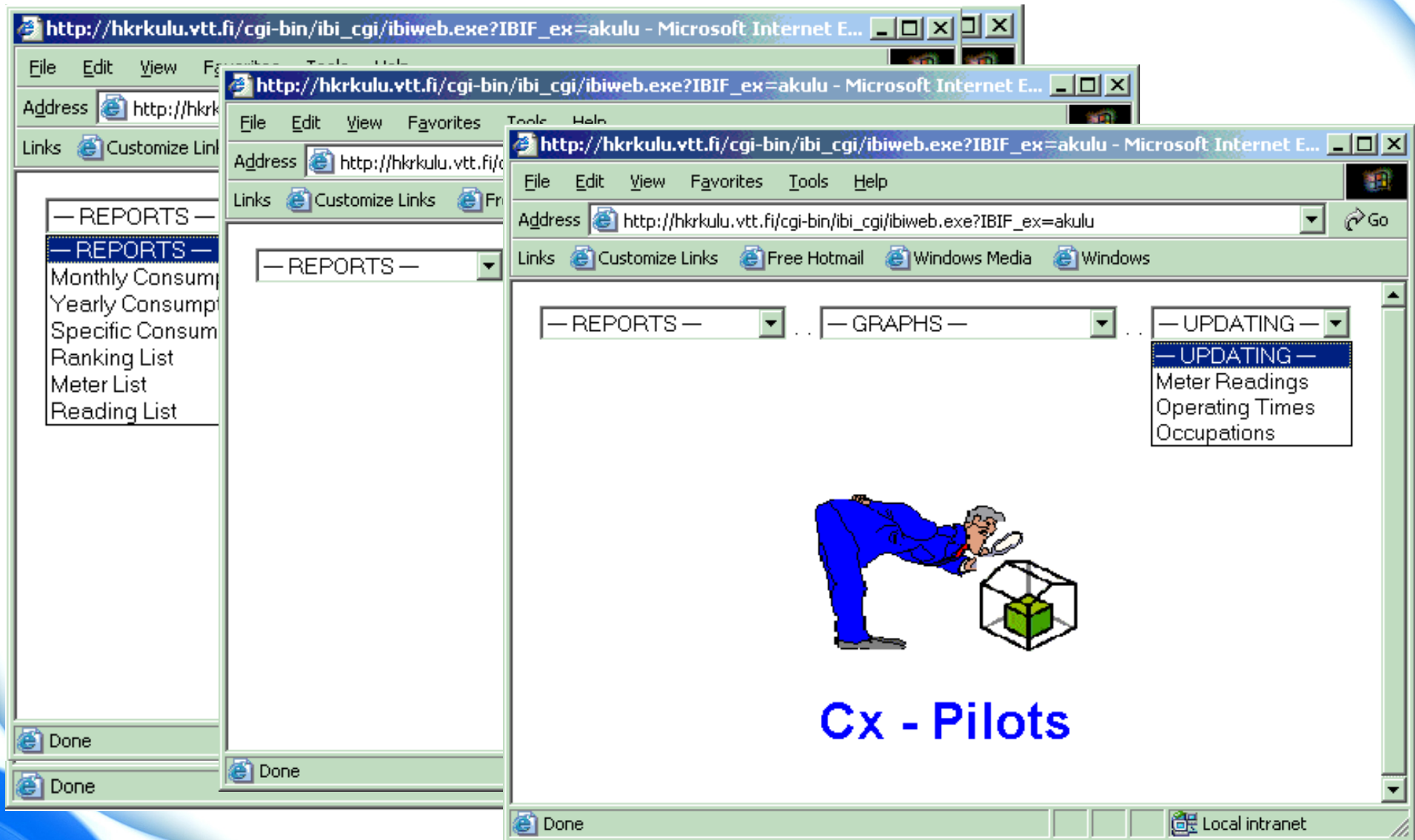


Used already in Annex36:

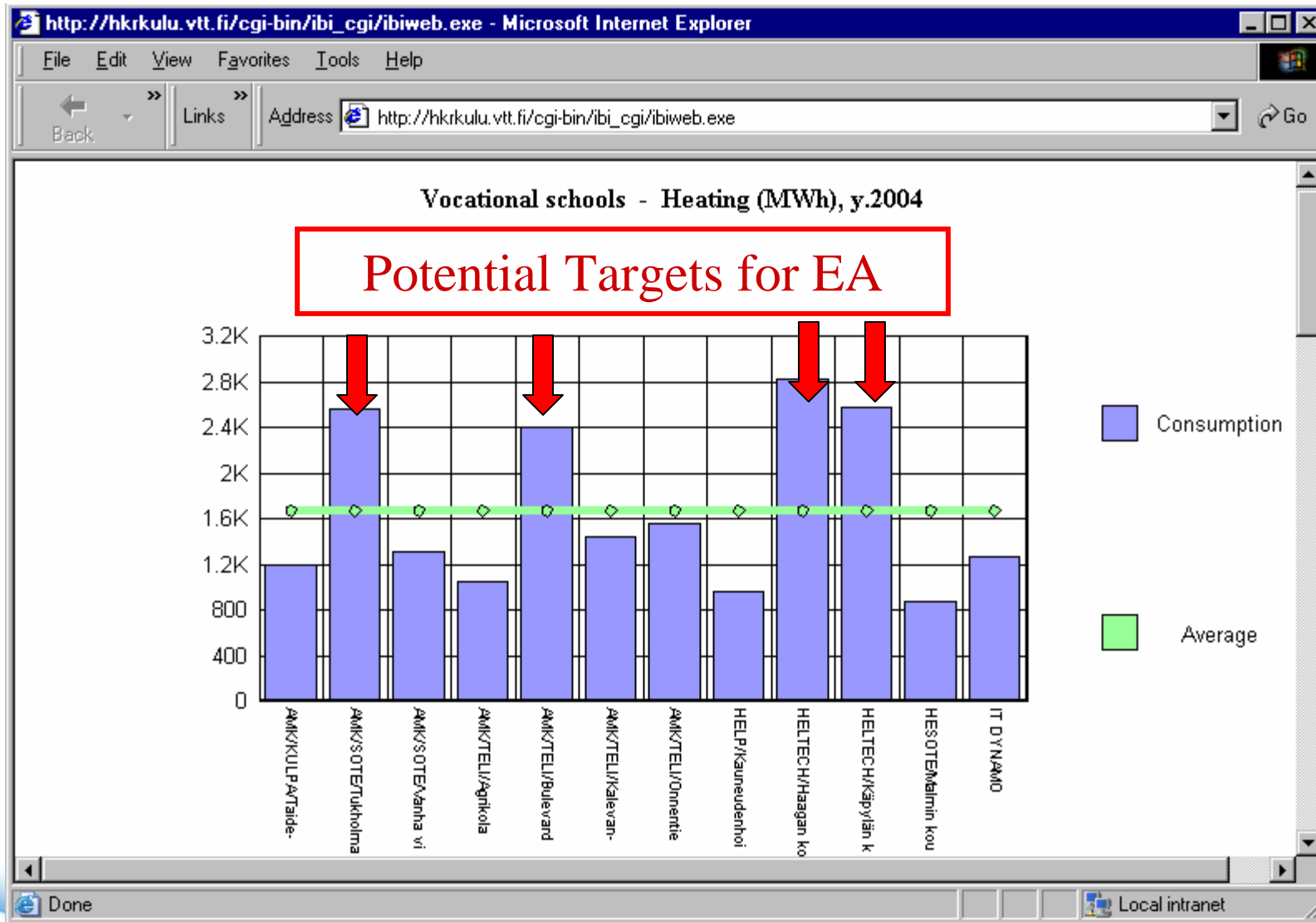


❁ Support English, German, French, Italian, Greek, Swedish, Polish, Czech, Estonian

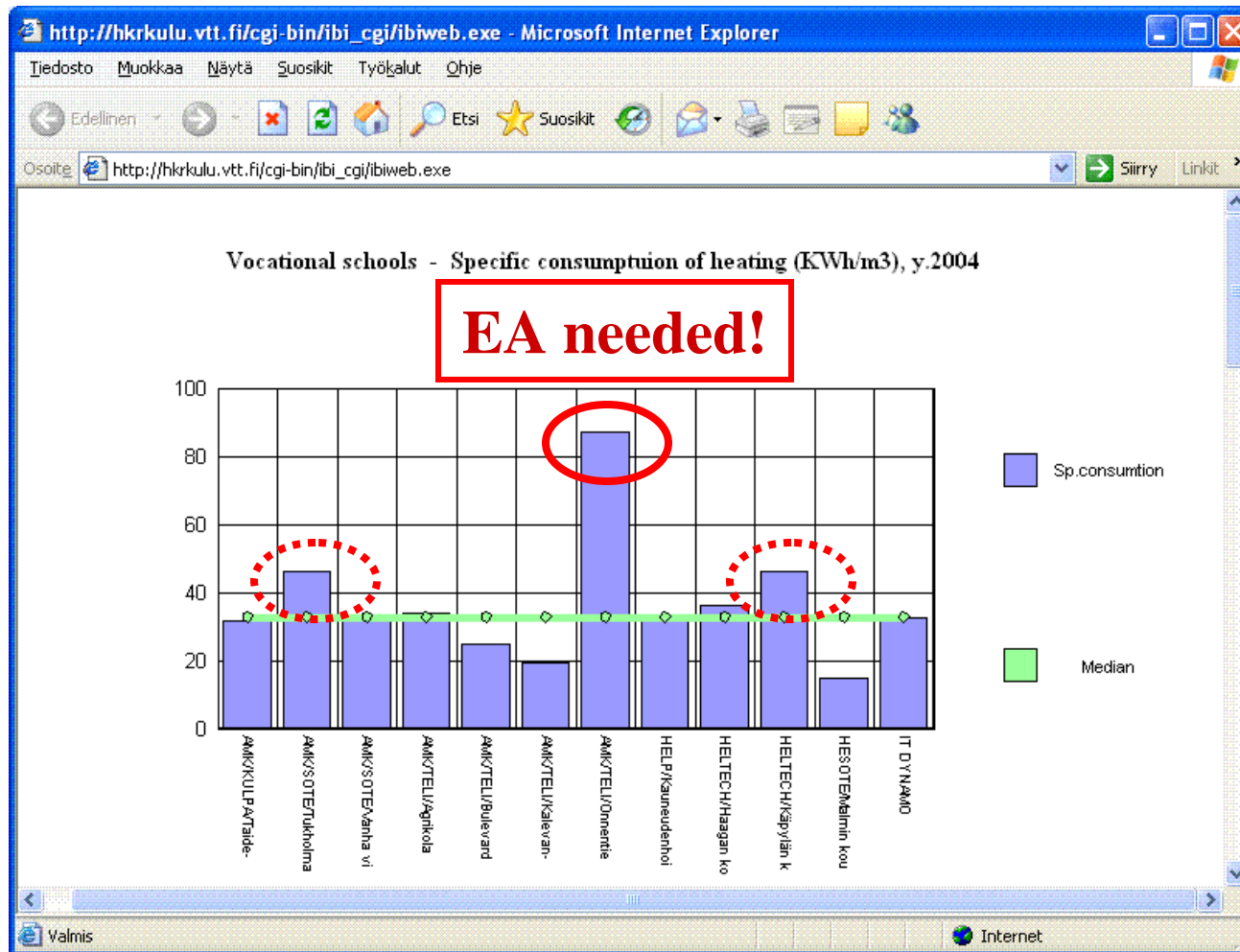
Available in the web as well:



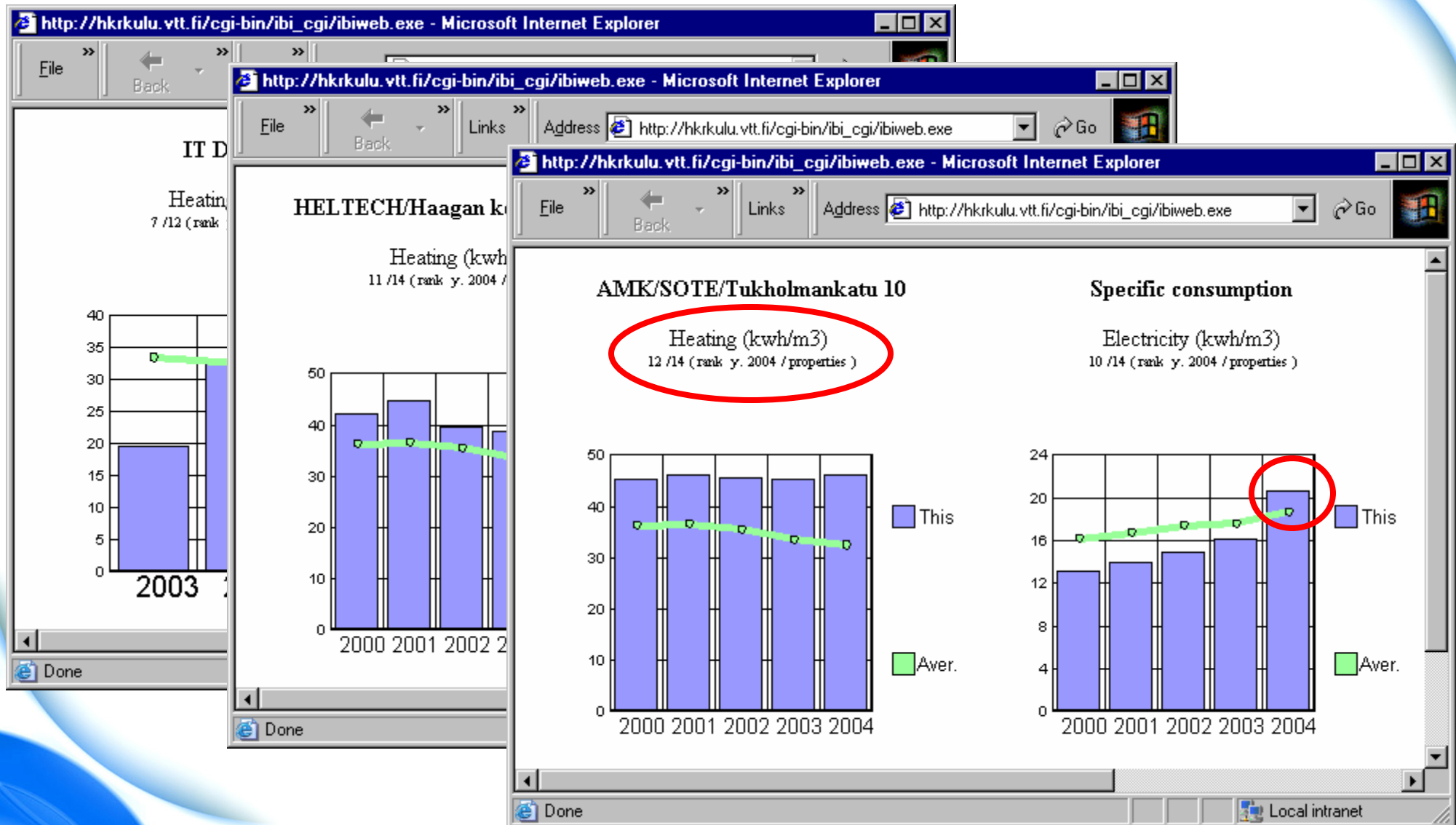
EA on Building Stock Level:



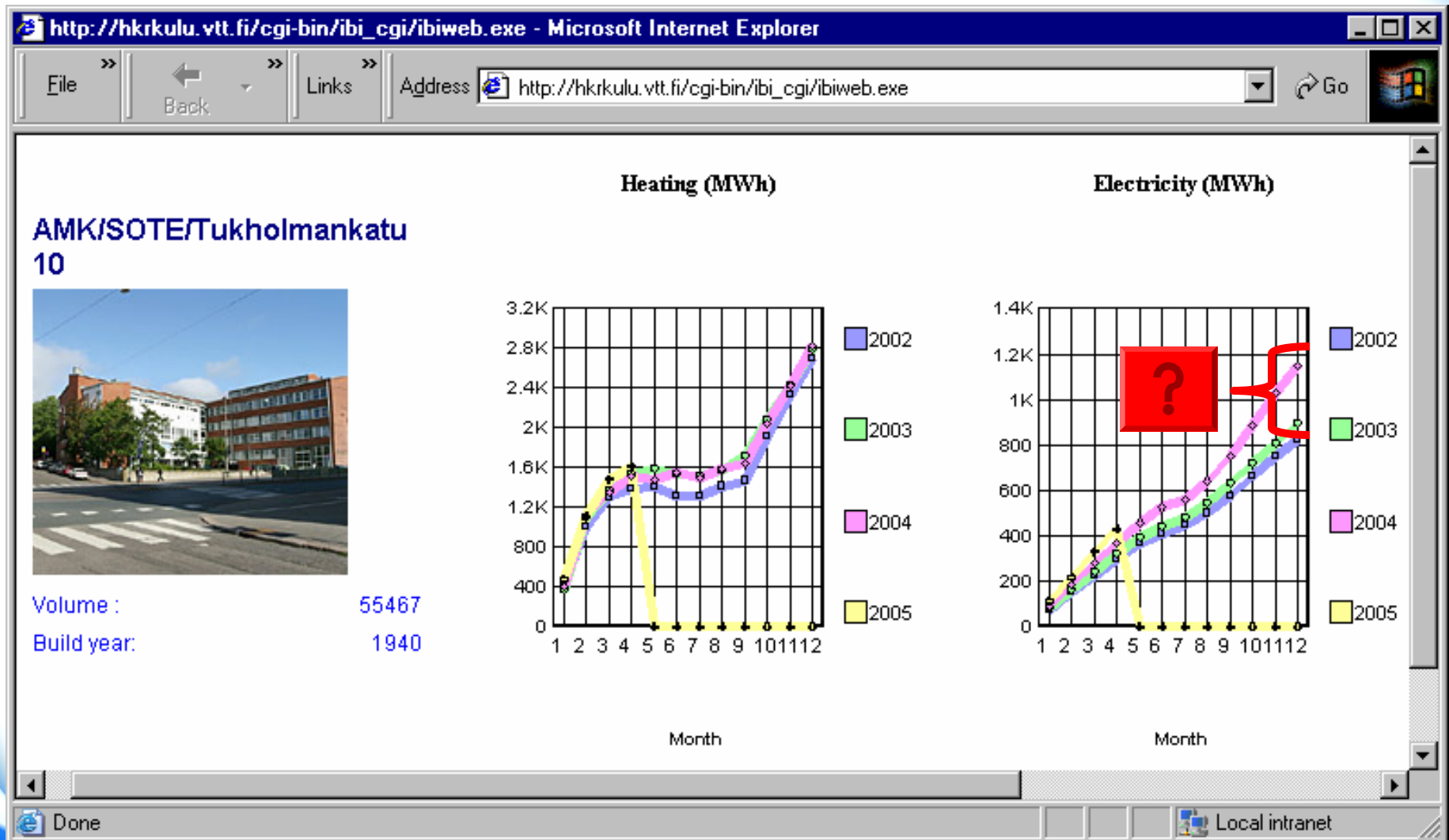
EA on Building Stock Level:



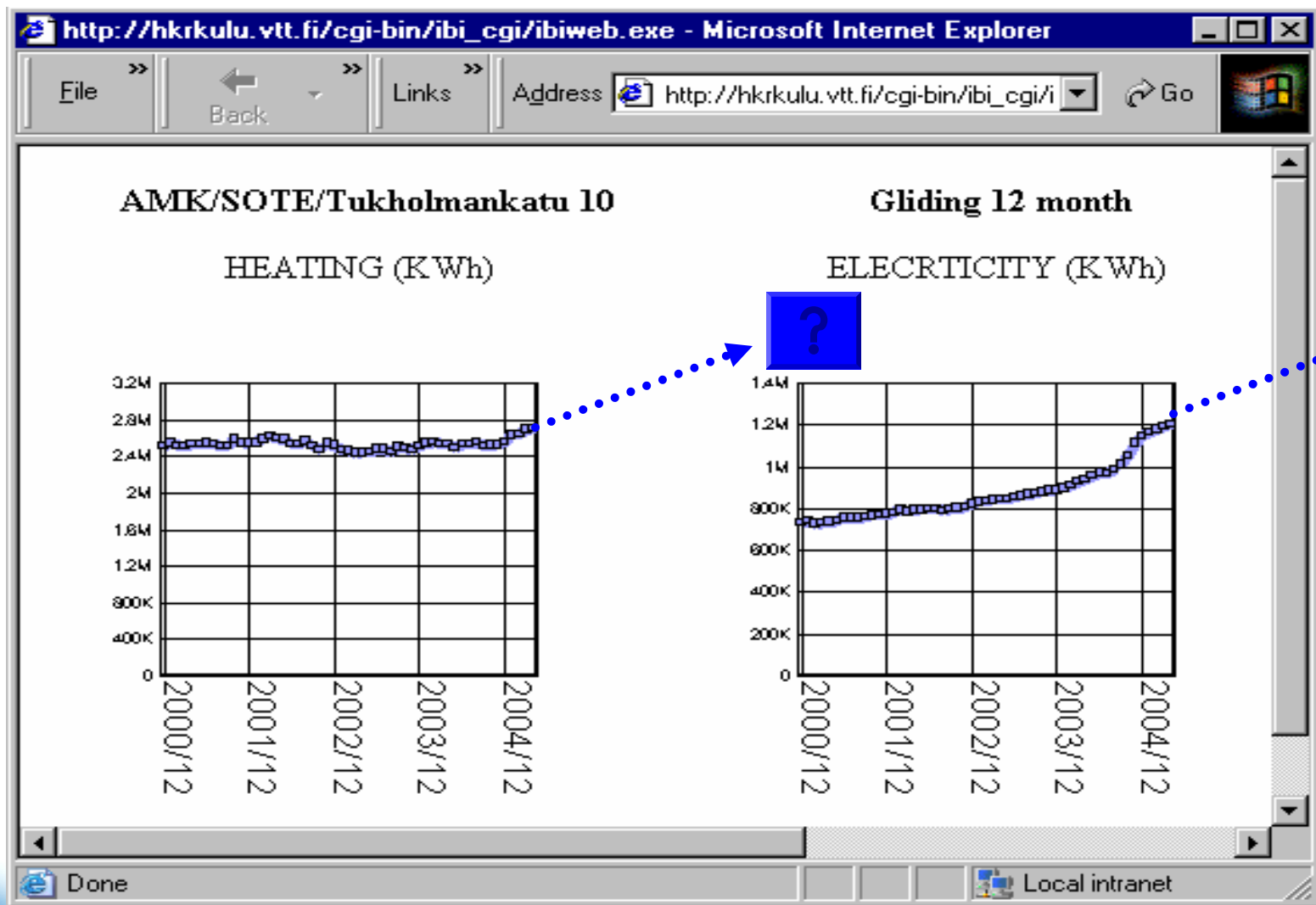
EA on Building Stock Level:



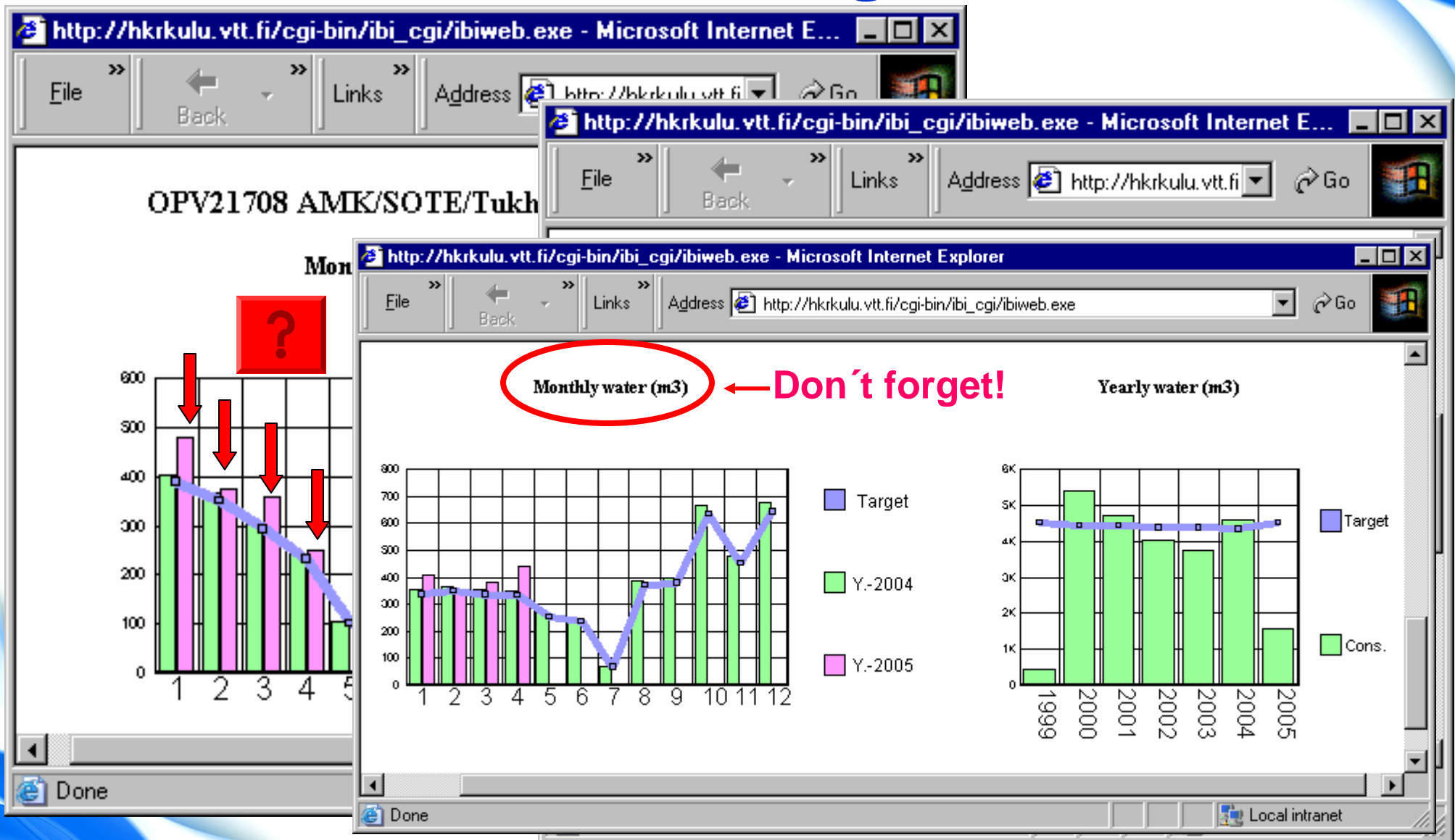
EA on Building Level:



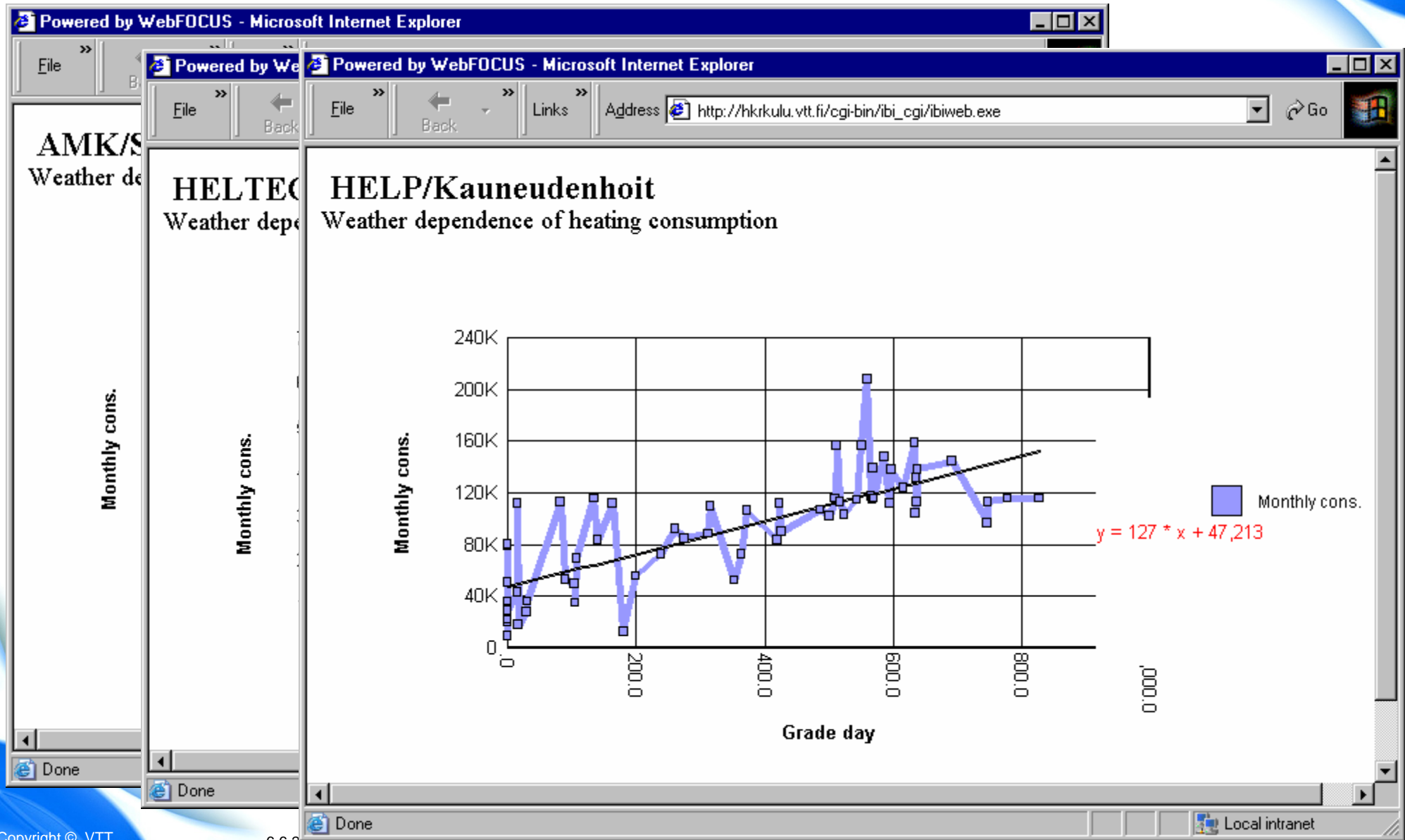
EA on Building Level:



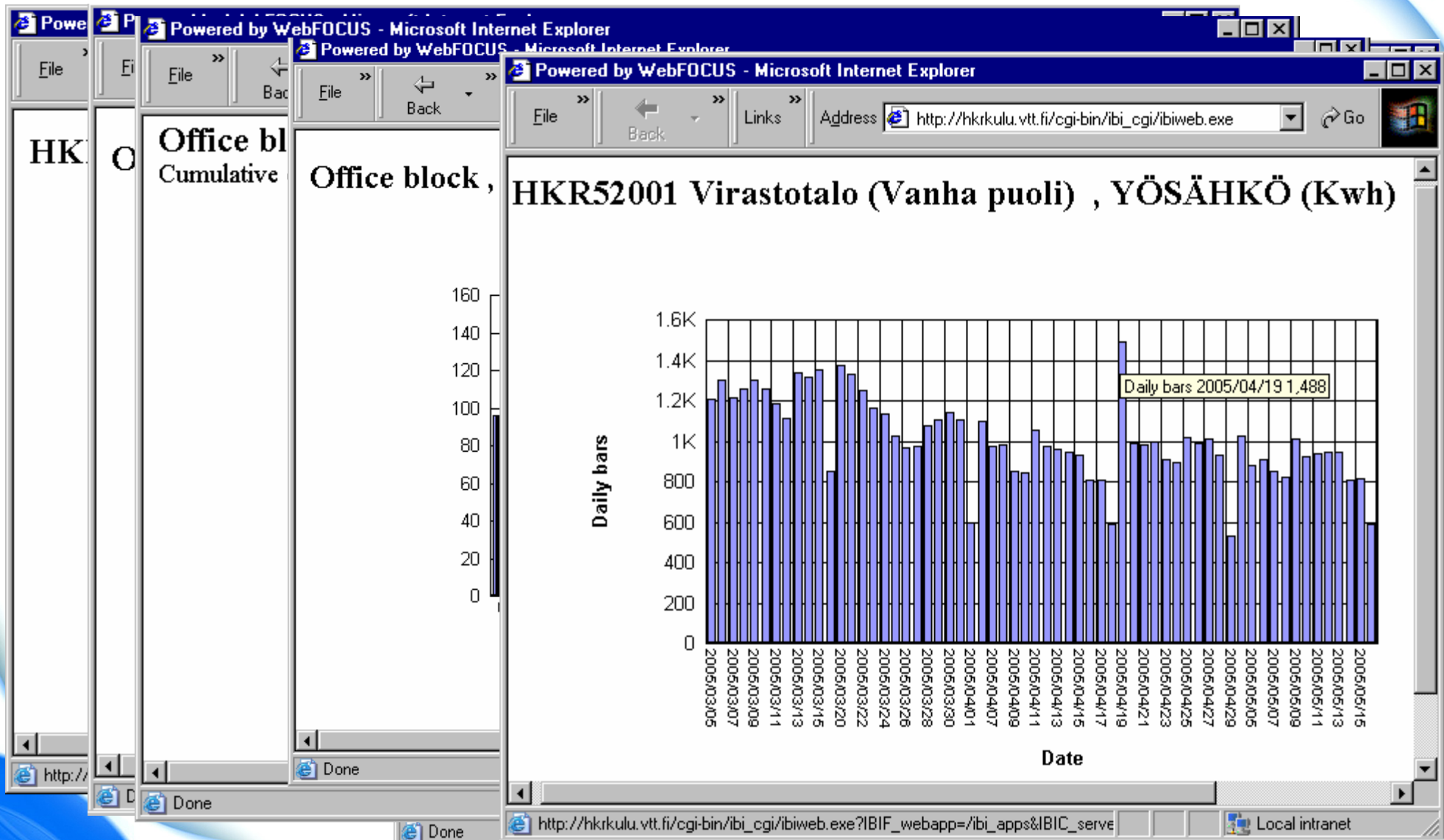
EA on Building Level:



EA on System Level:



EA on System Level:



Simple tools for data collection

Cars by WebFocus - Microsoft Internet Explorer

Address http://hkrkulu.vtt.fi/cgi-bin/ibi CGI/ibiweb.exe?IBIF_ex=KUMFLUK Go

Updating of meter readings

Valitse kiinteisto:

- AMK/SOTE/Vanha OPV21801
- AMK/TELI/Agrik OPV21704
- AMK/TELI/Bulev OPV21706
- AMK/TELI/Kalev OPV21705
- AMK/TELI/Onnen OPV21130
- HELP/Kauneuden OPV21703
- HELTECH/Haagan OPV21084
- HELTECH/Käpylä OPV21040
- HESOTE/Malmin OPV21502
- IT DYNAMO JYV00001**
- Virastotalo (U HKR52002
- Virastotalo (V HKR52001

Valitse mittari:

- 10 KAUKOLÄMPÖ**
- 20 SÄHKÖ (päämittari)
- 24 SÄHKÖ KEITTIÖ
- 30 SÄHKÖ JK11
- 31 SÄHKÖ JK21

Hae lukemat

10 KAUKOLÄMPÖ

Uusi lukematapaus on:

Lukema

(Anna lukematapaus vain jos se ei ole Lukema ja pvm jos se ei ole tämä päivä)

Uusi pvm ----- ja ----- lukema:

20050519

20050430	..... K	00000.00	..... 3383
20050331	..... K	00000.00	..... 6177
20050228	..... K	00000.00	..... 5175
20050131	..... K	00000.00	..... 4010
20041231	..... K	00000.00	..... 4239
20041130	..... K	00000.00	..... 3897
20041031	..... K	00000.00	..... 2458
20040930	..... K	00000.00	..... 1287

Päivämäärä ... Luk.tap. ... Lukema ... Kulutus/pv

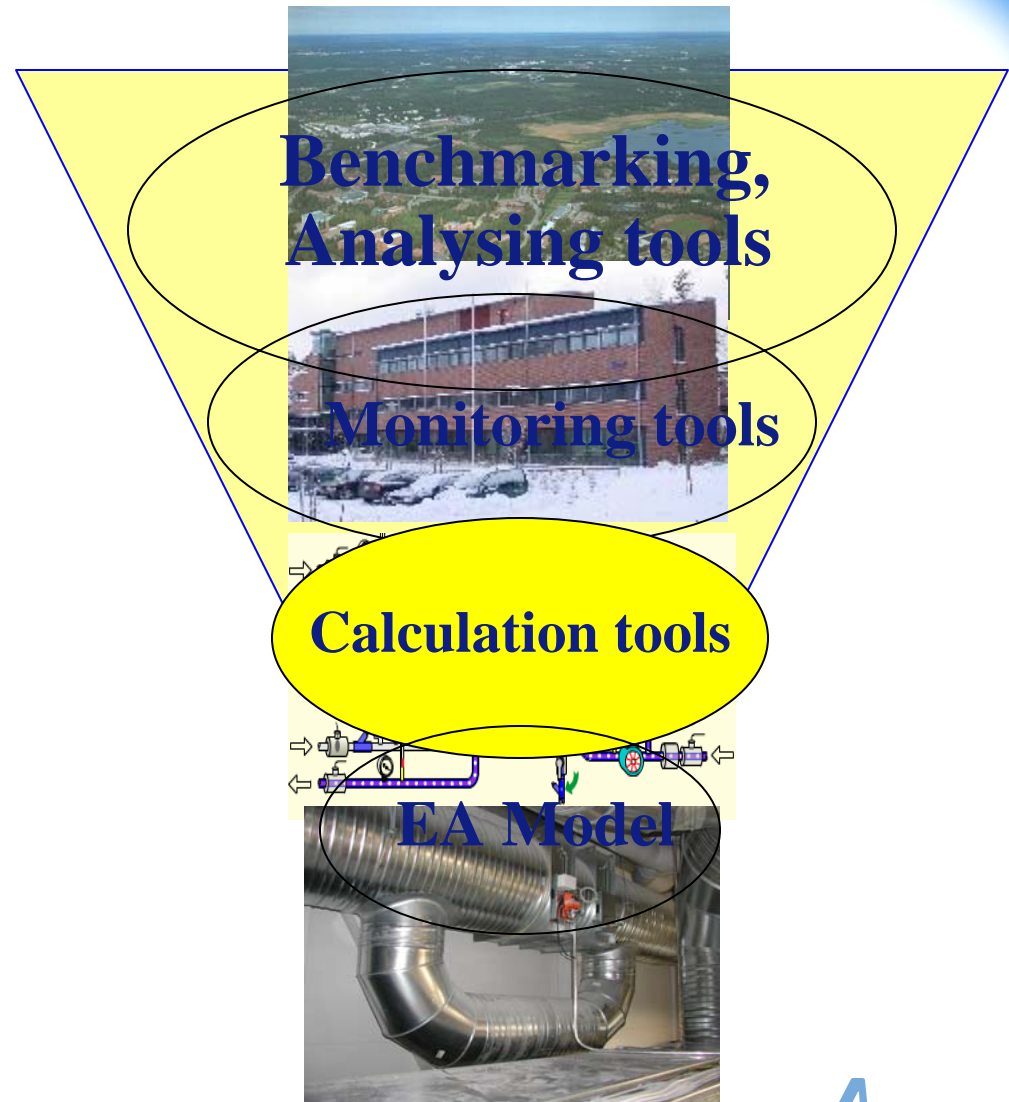
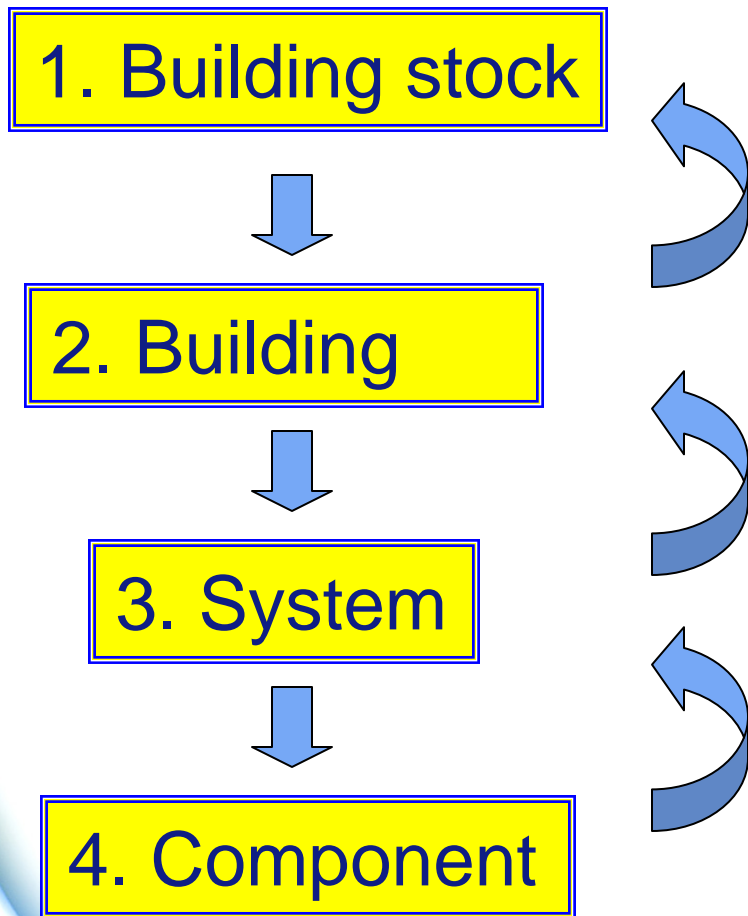
Vie kantaan

[Takaisin etusivulle](#)

[Käyttöohjeita](#)

Local intranet

Examples of EA Tools:



Calculation tools: (by Jari Shemeikka&Sami Karjalainen, VTT)

e3Portal - Information for the building energy management in municipalities - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss Real.com

Address <http://e3portal.vtt.fi/index.asp> Go

e3 ENERGY ENVIRONMENT ECONOMY

e3Portal
Information for the building energy management in municipalities

FI | SE | EN | ES

ENERGY MANAGEMENT

ENERGY TARGETING

- Calculation
- Quick estimate**

ENERGY MONITORING

ENERGY CONSUMPTION

ENERGY AUDITS

IMPLEMENTATION AND FINANCING

CLEARING HOUSE

E3P TOOL BOX

HELP AND CONTACTS

e3P-1.5-20040531

© 2004
VTT Building and Transport

Kuukausi Lämmitysenergia [kWh] Sähkö [kWh] Vesi [m3]

Tammikuu
Helmikuu
Maaliskuu
Huhtikuu
Toukokuu
Kesäkuu
Heinäkuu
Elokuu
Syyskuu
Lokakuu
Marraskuu
Joulukuu
Koko vuosi

Tallenna

Tallennetut ki

Laskentapvm
15.10.2003
20.10.2003
20.10.2003
21.10.2003
22.10.2003
27.10.2003

Käyttö

yksikkö: k

13367
13261

Lämi

lämmin

Muu lä johtuminen

Käyttö

Aurinko 11

Henkilöt 5

Sähkö

Tuloilman-lämmitys 0

Käyttövesi 5

Muu lämmitys 33

Henkilöt 2

Viemäri 3

Aurinko 8

Sähkö 19

Ilmanvaihto 24

Hyödyntämätön 14

Johtuminen 22

Vuoto-ilmanvaihto 5

kWh/m³

MOTIWATTI 2.0: ENERGY AUDITOR'S TOOL

(by Jari Shemeikka, VTT)

- Motiwatti is used in energy audits in Finland
- Properties:
 - Calculates the heating energy demand (space, ventilation and hot water), no cooling energy calculations
 - The electricity of fans in ventilation units is handled in detail
 - Easy to use principle
 - Fast shoe-box modeling of the building envelope with the help of the construction database defaults (categorized by building type and age)
 - Easy to use methodology for the energy saving measures

The basic data of the building

Motiwatti 2.0 Energy Auditor's tool - C:\Program Files\Motiwatti\Test office 2500 grossm2.mwt

Energy Audit Edit Show Window Modelling the site Calculation of savings Tools Help

Audit site basic data and measured consumptions: Typical office building

Basic data Summary Specific values

General information

Name of site: Typical office building

Date: 18.5.2005

Usage: 11 Commercial buildings

Year of construction: 2005

Building volume (gross): 10000 m³

Proportion of cold volume: 0 %

Building area (gross): 2500 m²

Proportion of cold area: 0 %

Number of floors: 4 number

Number of staff: 100 number

Degree day area: Helsinki-Kaisaniemi

Degree days of reference year: 4098 Kd

Consumption data, last three years

Latest year of consumption 2004 Standard part

	2004	2003	2002
Degree day value:	4444		Kd
Heat:	200		MWh/a
Electricity:	190		MWh/a
Water:	600		m ³ /a

☒ Use as reference year

Purchase of energy and water

Heat: DH >>>

Electricity: Helsinki Energy >>>

Water: Helsinki Water >>>

OK Cancel Help

Ready! 18.5.2005 15:46

A sample of the HVAC-auditors' view

Motiwatti 2.0 Energy Auditor's tool - C:\Program Files\Motiwatti\Test office 25...

Energy Audit Edit Show Window Modelling the site Calculation of savings Tools Help

Summary of heating energy demand

Calculated breakdown of heating energy demand

	MWh/a	kWh/m²	kWh/m²	
Heating of spaces:	219.28	21.93	87.71	Spaces>>
Ventilation units:	51.88	5.19	20.75	Ventilation>>
Heating of domestic hot water:	20.14	2.01	8.06	Water>>
Domestic water:	20.14	2.01	8.06	
Process water:	0.00	0.00	0.00	
Other heat:	0.00	0.00	0.00	
Losses:	42.64	4.26	17.06	Losses>>
Total:	333.94	33.39	133.58	
Actual consumption	184.43	18.44	73.77	

Breakdown Close Help

Water consumption and breakdown

Difference between actual measured and calculate

Consumption:

Actual measured: 600.00 m³/a

Calculated: 550.00 m³/a

Difference: 50.00 m³/a

Domestic water Hot water circulation Process water

Data for normal domestic hot water

Temperature of cold 5 °C

Temperature of hot water: 55 °C ☐ Electrical heating

Consumption breakdown

Using point	Cold water (m³/a)	Hot water (m³/a)	Heating energy (MWh/a)
Total	550.00	220.00	20.14
Domestic water	550.00	220.00	12.80
Toilets	0.00	0.00	0.00
Showers	550.00	220.00	12.80
Taps	0.00	0.00	0.00
Process water	0.00	0.00	0.00
Hot water circulation	0.00	0.00	7.34

Add Copy Edit Delete Export to Excel Saving measures

OK Cancel Help

Ready! 18.5.2005 15:49

Summary of the electricity consumption

Motiwatti 2.0 Energy Auditor's tool - C:\Program Files\Motiwatti\Test office 2500 gro...

Energy Audit Edit Show Window Modelling the site Calculation of savings Tools Help

Electricity consumption and breakdown

Difference between the actual measured and calculated consumption

Energy:

Actual measured: 190 MWh/a

Calculated: 297 MWh/a

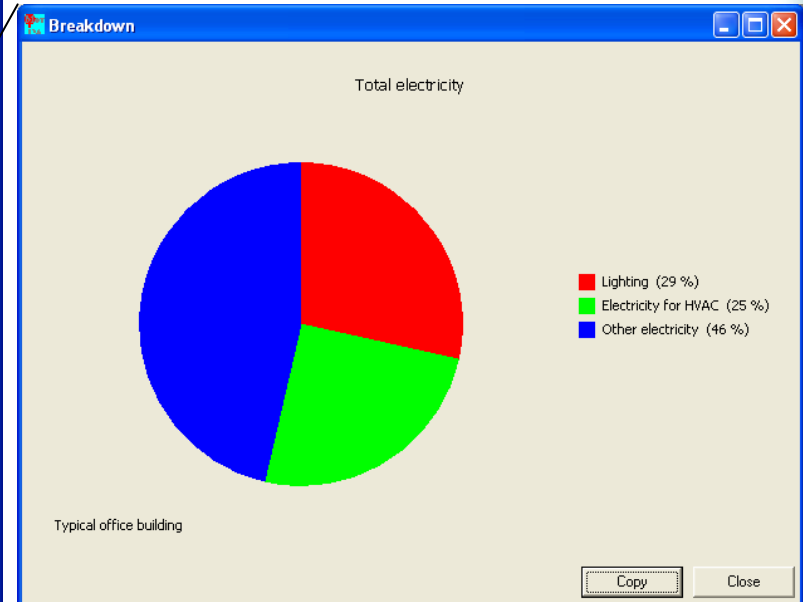
Difference: -107 MWh/a

Consumption breakdown:

Unit	Yearly consumption (MWh/a)
Total electricity	297.43
Lighting	85.20
Outside lightning	6.00
Lighting	79.20
Electricity for HVAC	74.07
Local exhausts	7.88
Office ventilation	34.94
Chiller, space conditioning	22.50
Pumps	8.76
Other electricity	138.16
Lift	10.00
Restaurant	28.16
Office appliances all	100.00

Buttons: Add equipment Add group Copy Edit Delete Breakdown Export to Excel Saving measures OK Cancel Help

Ready! 18.5.2005 15:54



A sample view of one saving measure, energy efficient lightning

Properties of saving measure

Name of saving: Energy efficient office lightning

Description: 12 W/m² -> 8 W/m²

Module: Electricity

Effect of the saving measure. Fees include VAT

	Before	After	Saving		Saving euro/a
Heat:	333.95 MWh/a	349.84 MWh/a	- 15.89 MWh/a		- 571.94
			Heating capacity: 0.00 kW		0.00
Electricity:	297.43 MWh/a	271.03 MWh/a	26.40 MWh/a		2 074.25
			Active power: 0.00 kW		0.00
			Reactive power: 0.00 kVAr		0.00
Water:	550.00 m ³ /a	550.00 m ³ /a	0.00 m ³ /a		0.00
Investment:	25 000 euro		Combined effect of the saving m 1 502.31 euro/a		
Pay-back time:	16.6 a				

Energy prices used in the saving calculation. Fees include VAT

Heating energy:	36.00 euro/MWh	Electrical energy:	78.57 euro/MWh	Reactive power:	0.00 euro/kVAr
Heating capacity:	0.00 euro/kW	Active power:	0.00 euro/kW	Water:	2.50 euro/m ³

Energy price used in saving calculations and the effect on power fee must be checked. Otherwise the calculation will be made using the average price of the original electricity tariff.

Close Help

Moti watti calculates the net saving

-saving lightning energy means increased space heating energy consumption

The summary of the energy saving measures

Motiwatti 2.0 Energy Auditor's tool - C:\Program Files\Motiwatti\Test office 2500 grossm2.mwt

Energy Audit Edit Show Window Modelling the site Calculation of savings Tools Help

Organiser of measures

Energy saving measures for site.
Show measures on module level: All
Choose appearance of table: Table II

Measures compared to initial case. Gross savings. Fees include VAT

Measure	Total saving.(euro/a)	Pay-back (a)	Investment (euro)
<input checked="" type="checkbox"/> New windows	413	72.7	30 000
<input checked="" type="checkbox"/> New heat recovery	983	12.2	12 000
<input checked="" type="checkbox"/> Local exhausts new fans	254	19.6	5 000
<input checked="" type="checkbox"/> Local exhausts: running time from 24 h/day to ...	2 155	0.0	50
<input checked="" type="checkbox"/> Energy efficient office lightning	1 502	16.6	25 000
<input checked="" type="checkbox"/> New showers heads	220	2.3	500

Combined effect of measures, calculating top down. Net savings. Fees include VAT

Measure	Total saving.(euro/a)	Pay-back (a)	Investment (euro)
Total	5 486	--	72 550
Local exhausts: running time from 24 h/day to 15 ...	2 155	0.0	50
New showers heads	220	2.3	500
New heat recovery	983	12.2	12 000
Energy efficient office lightning	1 559	16.0	25 000
Local exhausts new fans	159	31.4	5 000
New windows	410	73.1	30 000

Delete selected Export to Table 2 Calculate

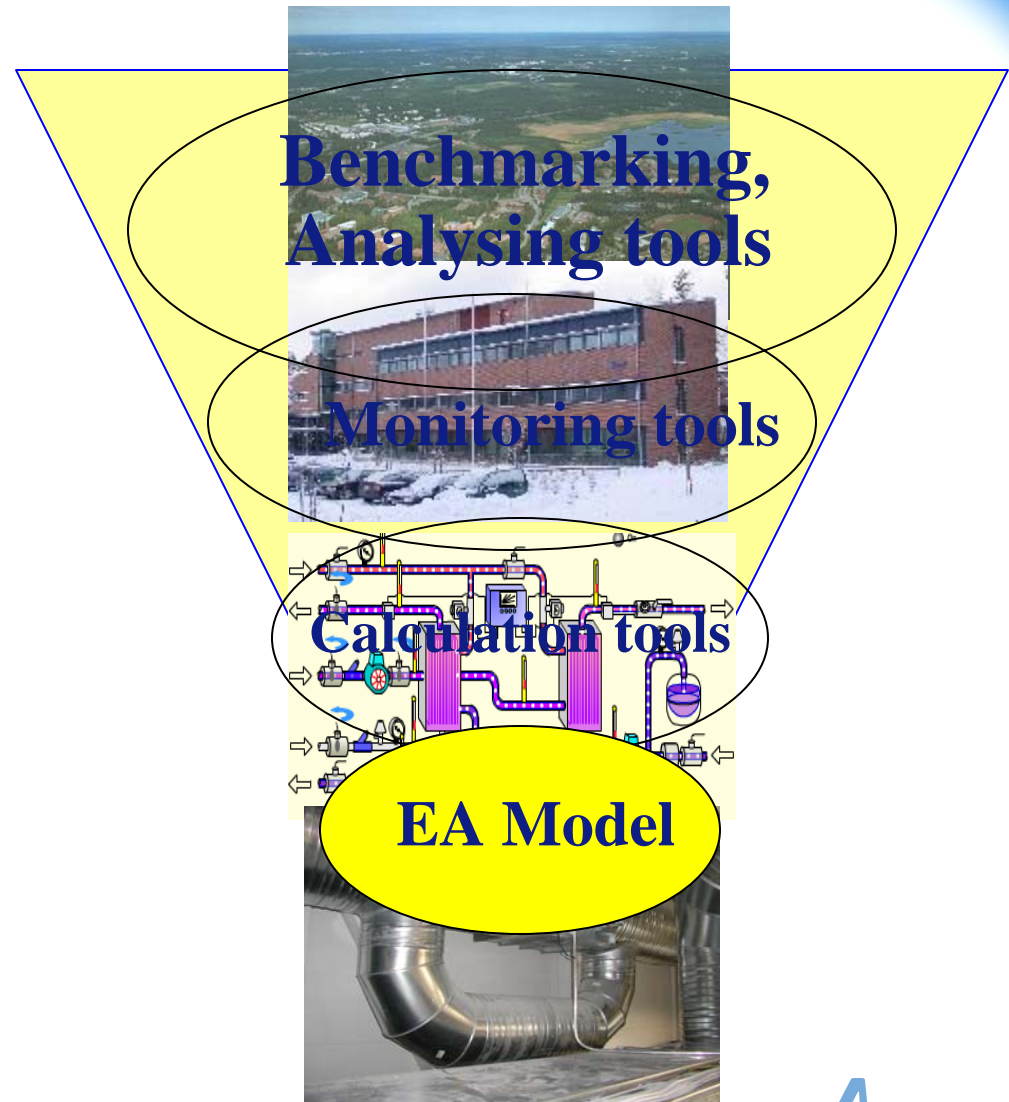
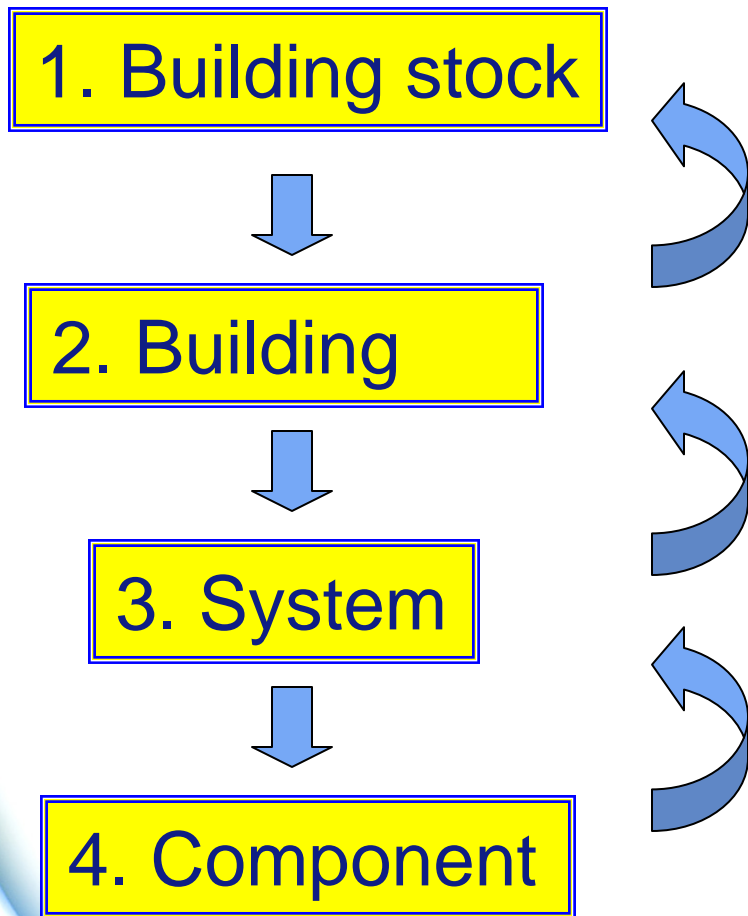
Close Help

Ready! 18.5.2005 15:57

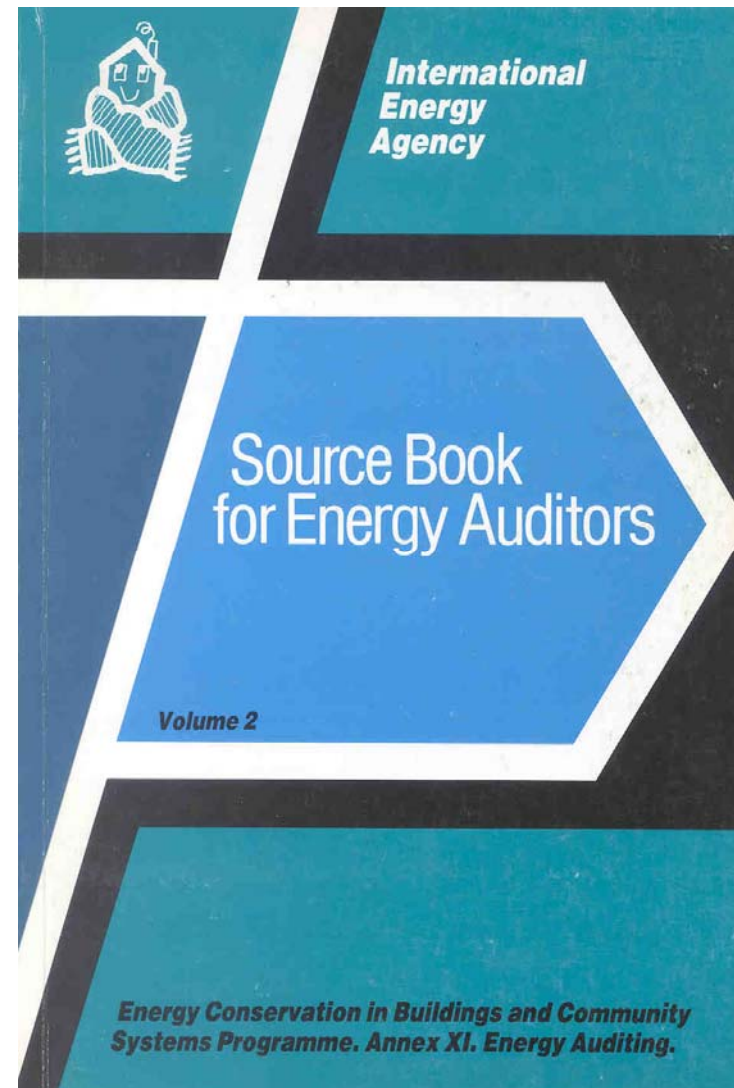
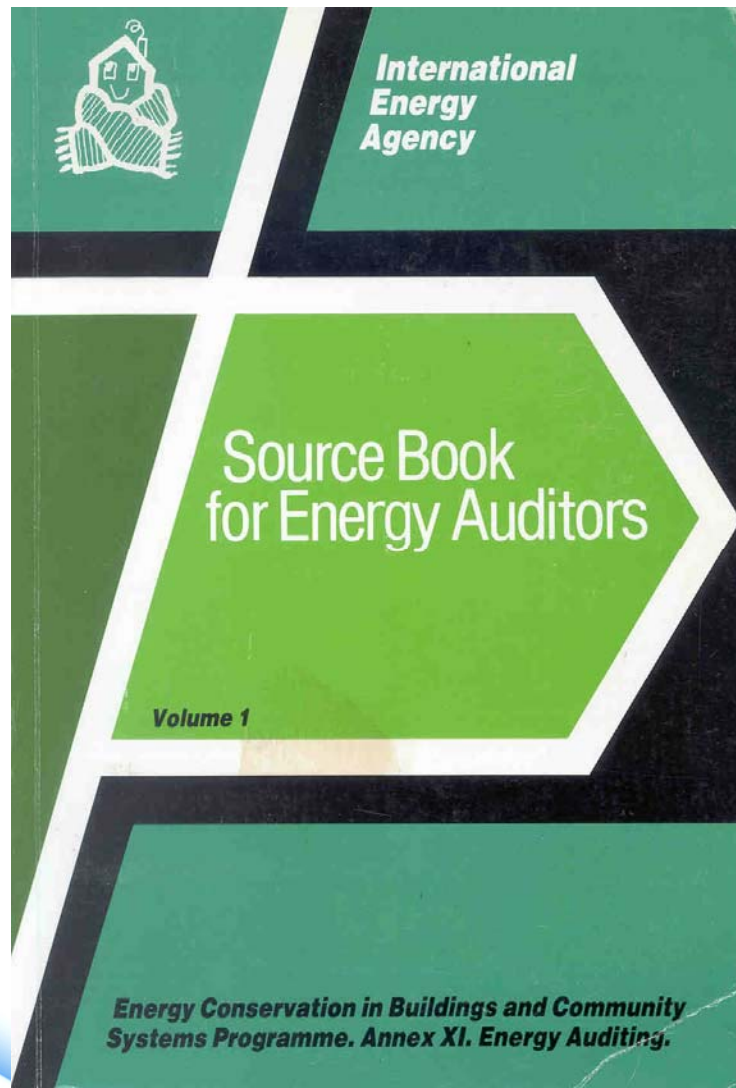
List of all individual
calculated measures

List of the
recommended
measures calculated
top down in chain

Examples of EA Tools:



Material and tools already available



Material and tools already available

IEA ECBCS Annex 36:

Retrofitting of Educational Buildings – REDUCE

Energy Concept Adviser for Technical Retrofit Measures

Energy Audit Procedures

DECEMBER 2003

EDITOR: JAN DE BOER



What is an Energy Audit?

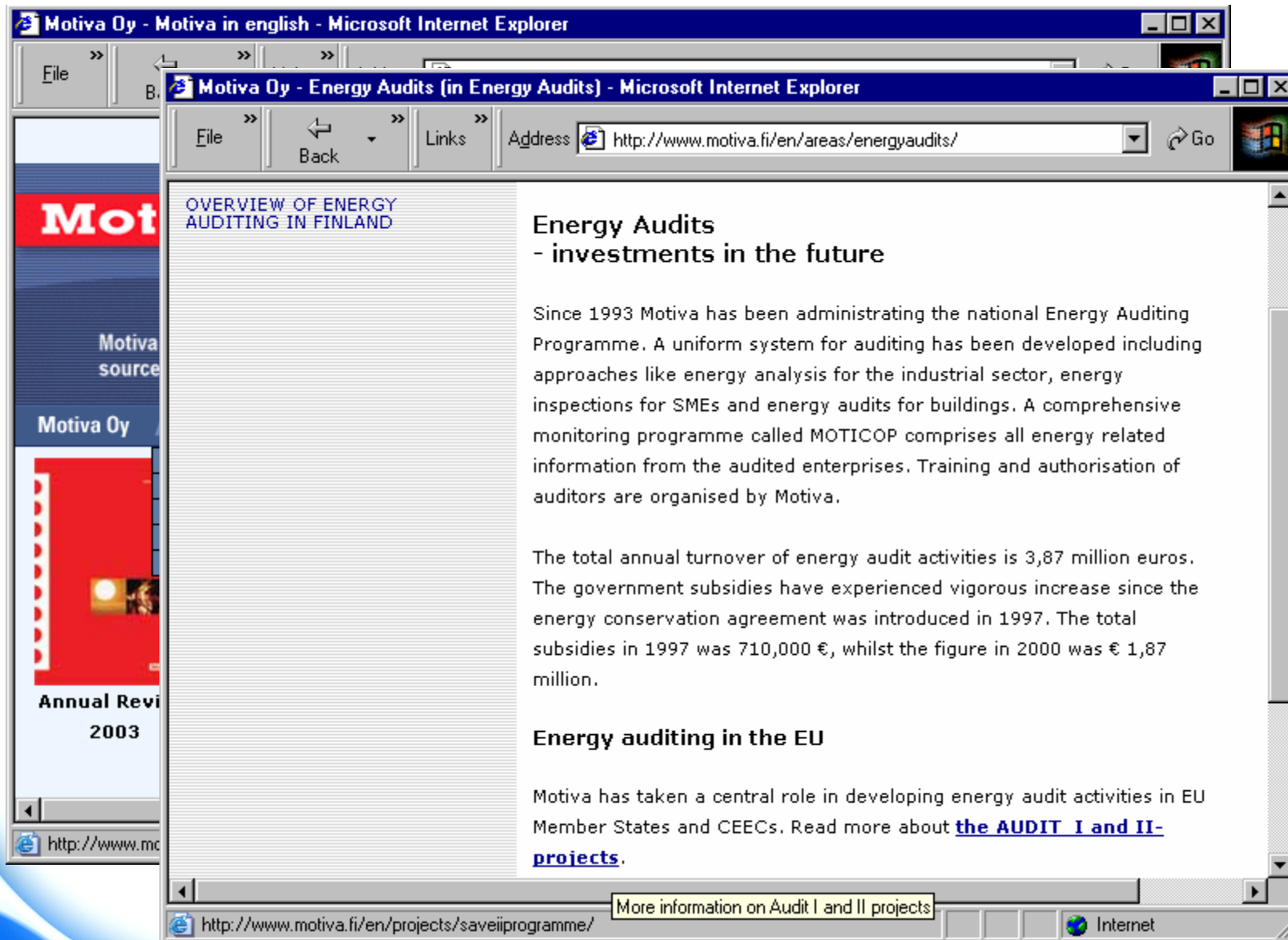
(Source:Motiva)

- **With energy audits we mean a systematic procedure in existing buildings/ sites/objects where the purpose is to**
 - evaluate the existing energy consumption
 - identify the energy saving potential and find the potential of renewable energy sources
 - report and make detailed saving proposals
 - (monitor the realisation of proposals/retrofit measures)
 - (assess the influences and and saving achieved)

Motiva

Energiankäytön uusi suunta

National Information Center for Energy Efficiency





Haku Palaute Energialinkit

Pääsivulle Motiva Oy Toiminta-alueet Yrityksille ja yhteisöille Kuluttajille Kirjasto Julkaisut Uutiskeskus Ekstranet-palvelut

<< ENGLISH

ENERGY AUDITS

- [Audit I project and Audit 1999 Conference](#)
- [Audit II Project](#)
- [Working Group Energy Audit, "Operating Agents' Network"](#)

Audit I project and Audit 1999 Conference

Motiva co-ordinated the first European level study on energy auditing during years 1998-2000. This SAVE II Programme project "Energy Audit Management Procedures (AUDIT)" was implemented in co-operation with IFE (Norway) and C.R.E.S (Greece), also involved in energy auditing at national level. The Final Report presents the first theories on energy auditing as well as national experiences on all Member States. Some 1000 copies of the Final Report have been downloaded from over 40 countries since the report was published in March 2000.

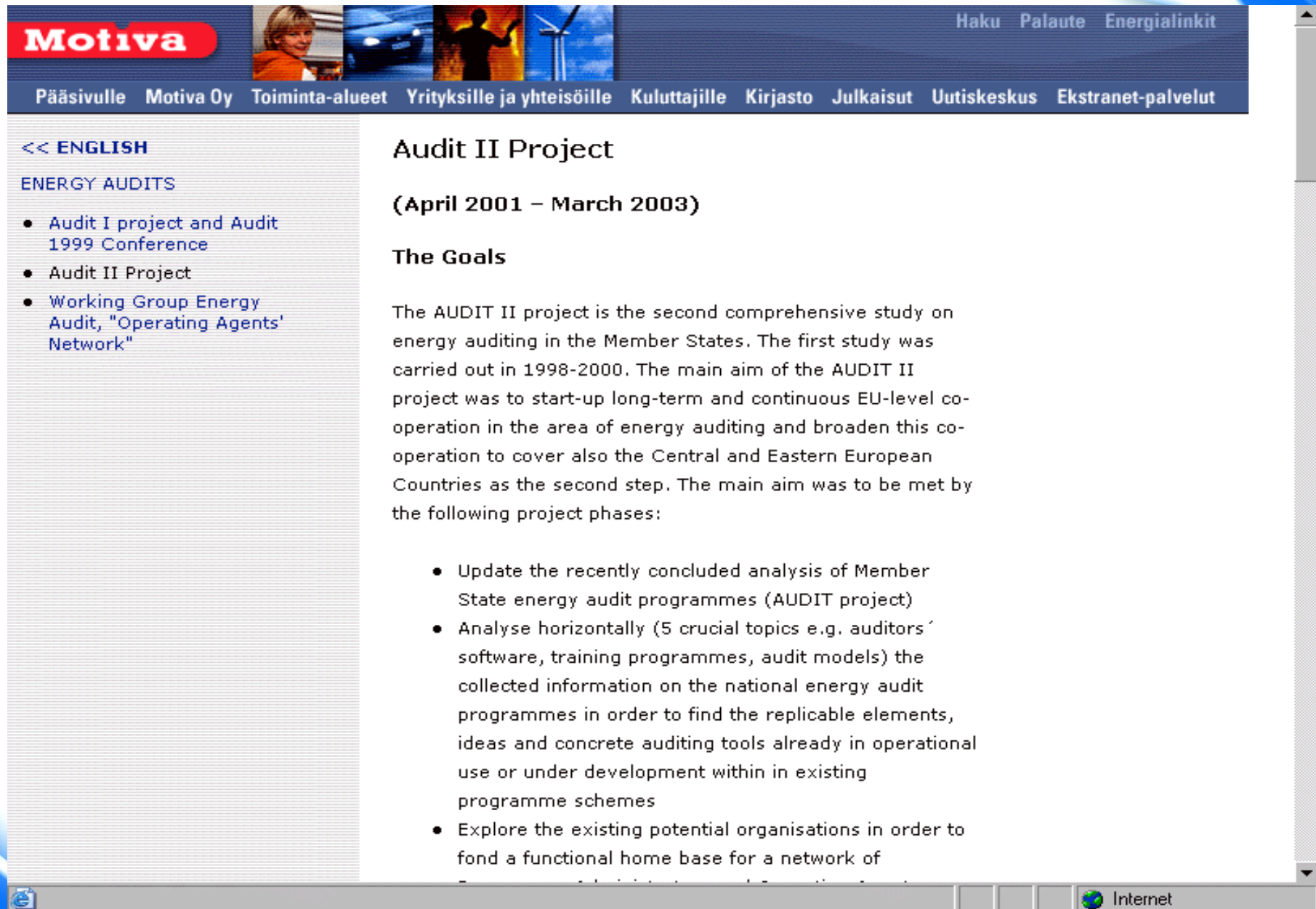
(AUDIT – Energy Audit Management Procedures, SAVE II Programme, final report, [load_pdf](#))



International Conference on Energy Audits, AUDIT '99
10.-12.10.1999 Turku, Finland

Parallel to the AUDIT project Motiva hosted the first international conference on energy audits, AUDIT '99, in October 1999 in Finland.

 Internet



Motiva Haku Palaute Energialinkit

Pääsivulle Motiva Oy Toiminta-alueet Yrityksille ja yhteisöille Kuluttajille Kirjasto Julkaisut Uutiskeskus Ekstranet-palvelut

<< **ENGLISH**

ENERGY AUDITS

- [Audit I project and Audit 1999 Conference](#)
- [Audit II Project](#)
- [Working Group Energy Audit, "Operating Agents' Network"](#)

Audit II Project

(April 2001 – March 2003)

The Goals

The AUDIT II project is the second comprehensive study on energy auditing in the Member States. The first study was carried out in 1998-2000. The main aim of the AUDIT II project was to start-up long-term and continuous EU-level co-operation in the area of energy auditing and broaden this co-operation to cover also the Central and Eastern European Countries as the second step. The main aim was to be met by the following project phases:

- Update the recently concluded analysis of Member State energy audit programmes (AUDIT project)
- Analyse horizontally (5 crucial topics e.g. auditors' software, training programmes, audit models) the collected information on the national energy audit programmes in order to find the replicable elements, ideas and concrete auditing tools already in operational use or under development within in existing programme schemes
- Explore the existing potential organisations in order to find a functional home base for a network of

Internet



The Guidebook for Energy Audit Programme Developers

Guidebook for Energy Audit Programme Developers
([GB_Printversion.pdf](#), size 834 kB)

The Topic Reports

TR Monitoring and Evaluation: Published September 2002
(AUDIT II Topic Report, [pdf](#), 221 kB)

TR Energy Audit Models: Published April 2003
(AUDIT II Topic Report, [pdf](#), size 309 kB)

TR Training, Authorisation and Quality Control:
UPDATED September 2002
(AUDIT II Topic Report, [pdf](#), size 241 kB)

TR Auditor's Tools: Published August 2002
(AUDIT II Topic Report, [pdf](#), size 193 kB)

TR Implementing Instruments: Published September 2002
(AUDIT II Topic Report, [pdf](#), 230 kB)

The Country Reports, Group I

CR Austria: Published August 2002
(AUDIT II Country Report - Austria, [pdf](#), 264 kB)

CR Belgium: Published September 2002
(AUDIT II Country Report - Belgium, [pdf](#), 247 kB)

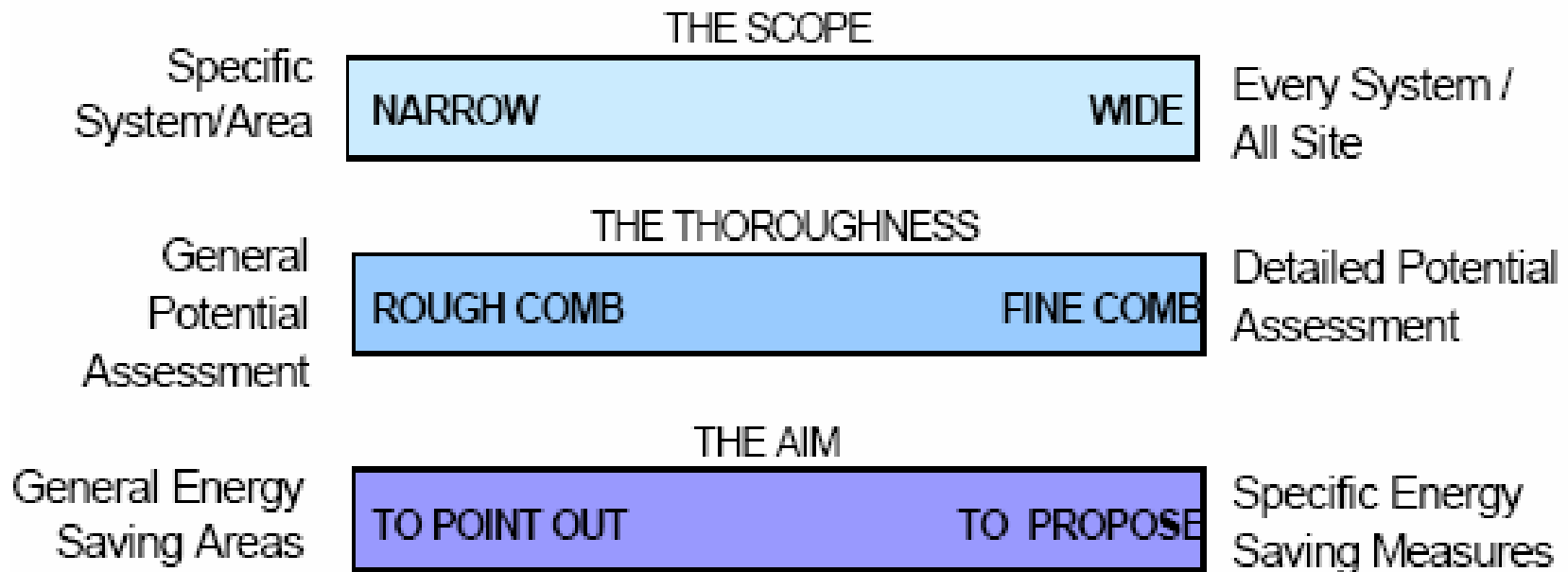
CR Denmark: Published September 2002
(AUDIT II Country Report - Denmark, [pdf](#), 245 kB)

CR Finland: Published May 2002
(AUDIT II Country Report - Finland, [pdf](#), size 1,1 MB)

CR France: Published May 2002

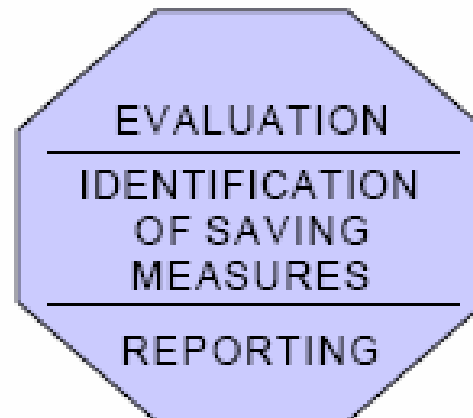


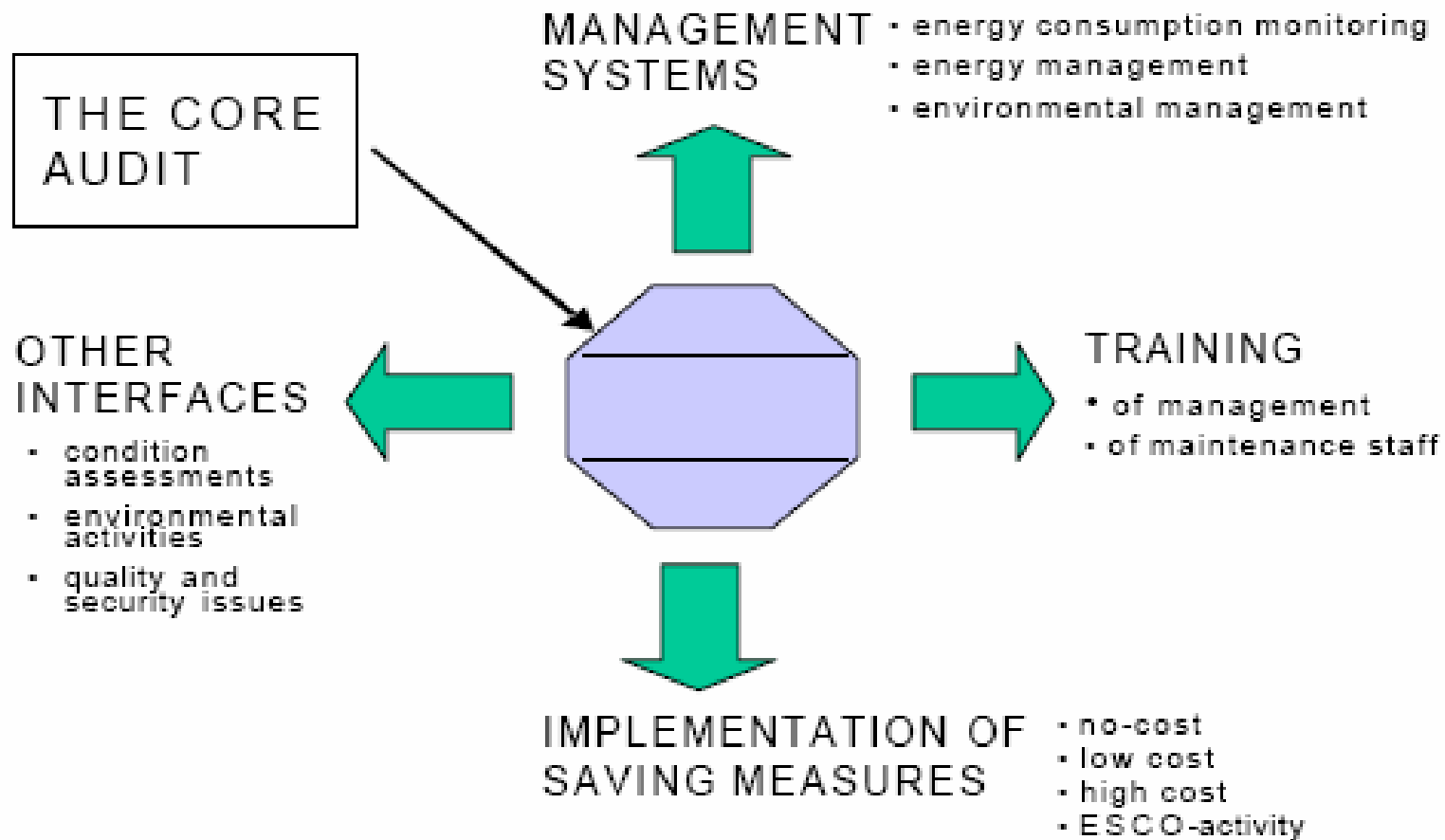
The properties of energy audit models



Source:SAVE-project AUDIT II

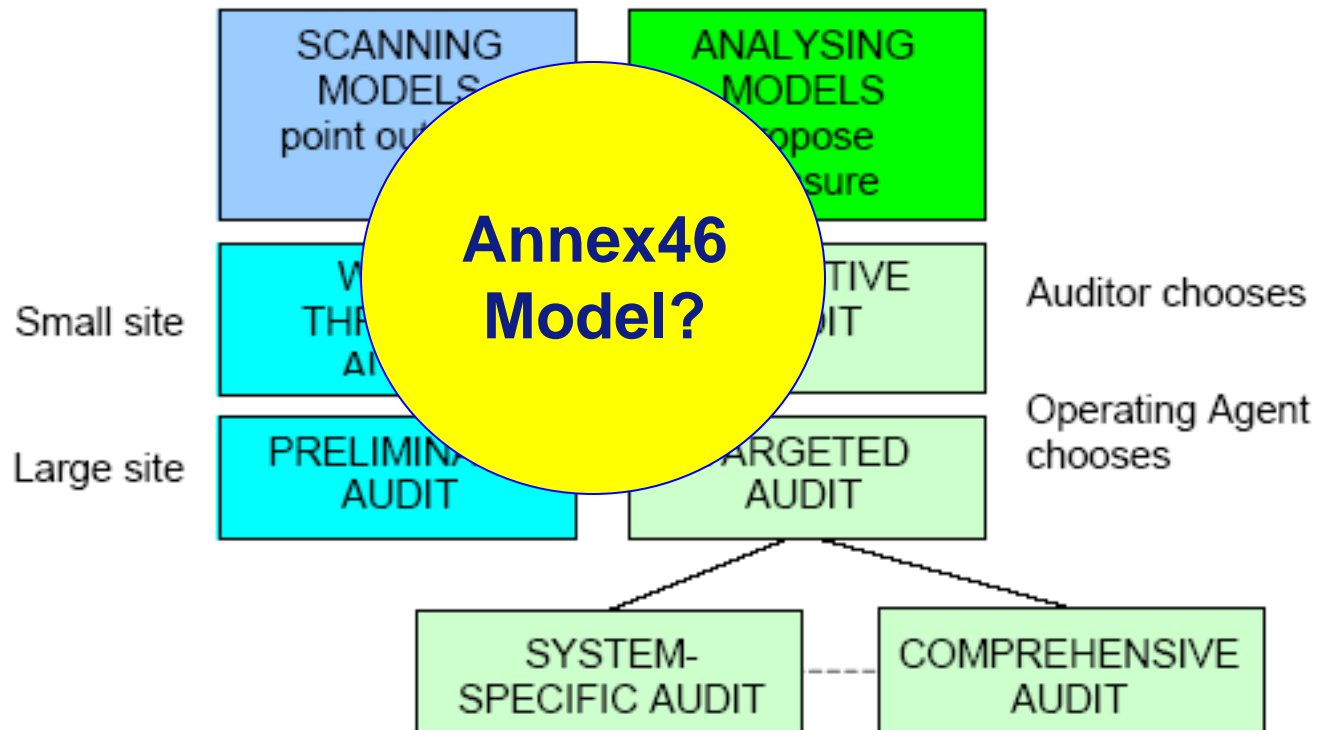
- The Core Audit is the heart of all possible energy audits and includes the steps of
- **evaluating** the present energy consumption
 - **identifying** of energy saving possibilities
 - **reporting**.





Basic Energy Audit Models

(Source:SAVE-project AUDIT II)





AUDIT II

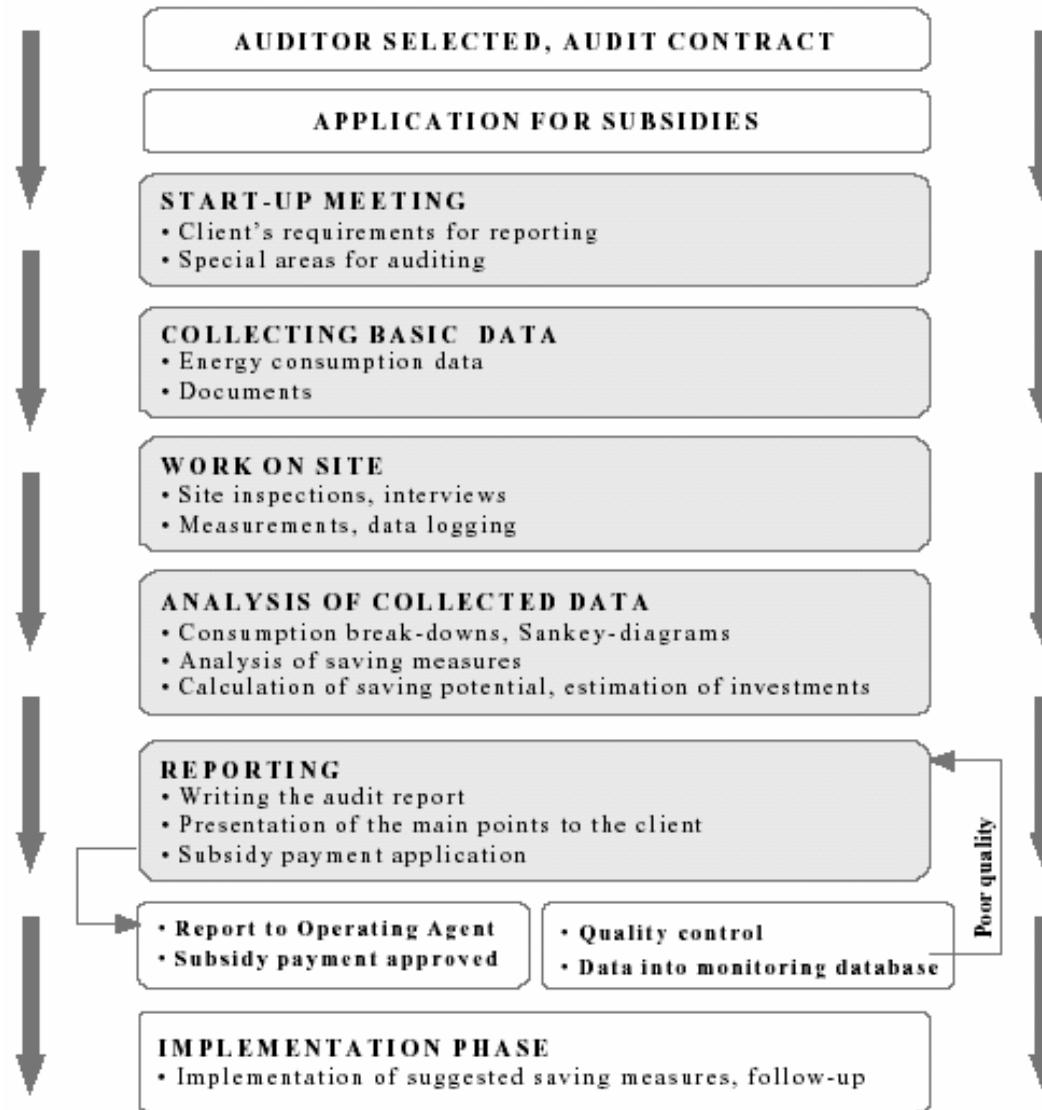
Country Report **GERMANY** (Draft Version)

Michael Sattler
Final Report 13.12.2002

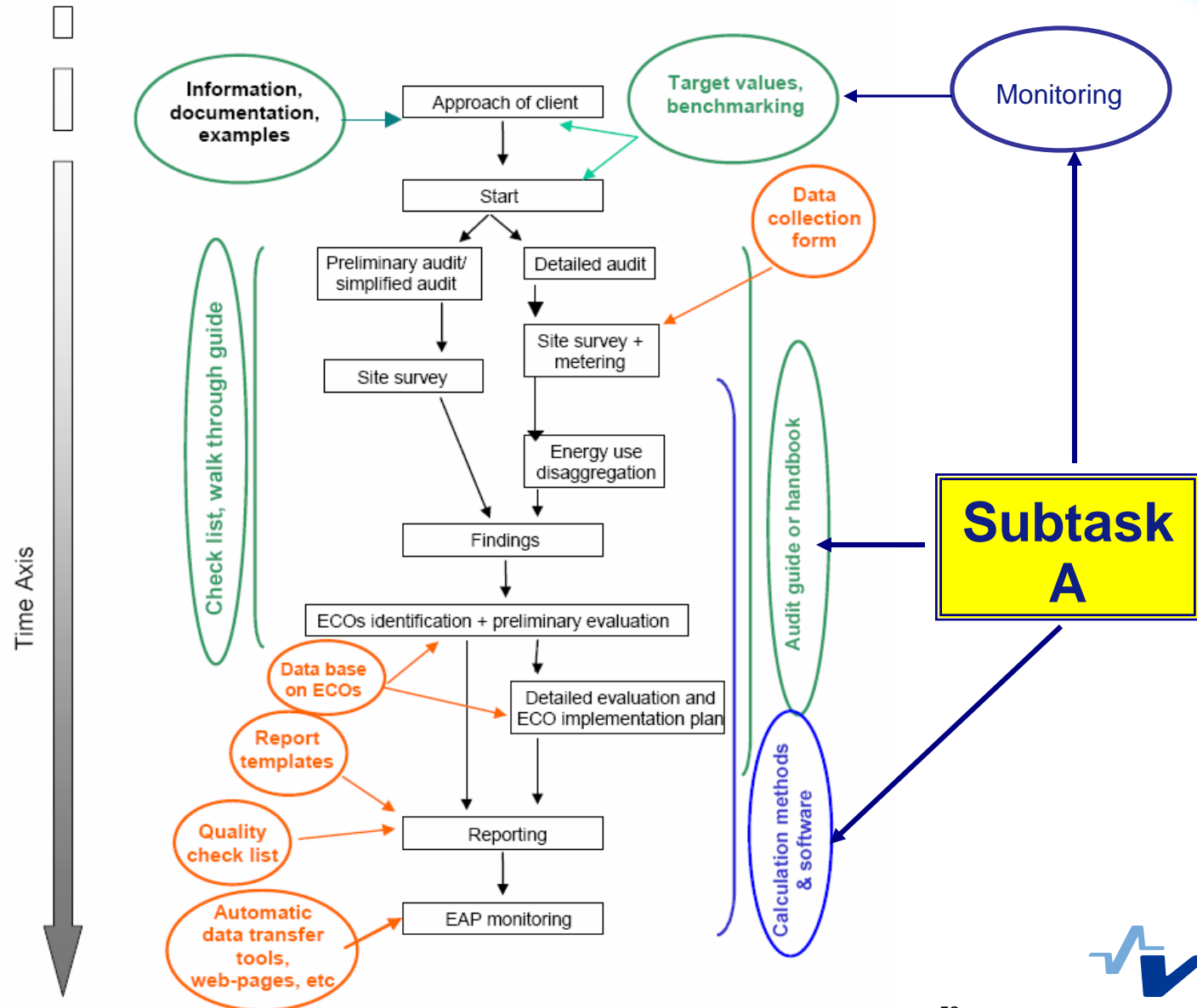


The Finnish Energy Audit Procedure

(Source:SAVE-project AUDIT II)



EA Tools (Source:SAVE-project AUDIT II)



EA Tools

(Source:SAVE-project AUDIT II)

Definitions	Pros and Cons, comments
Information/documentation on technical topics (ECOs³, Branch specific...)	
Information support document, it is often based on case studies and intended to help marketing the audits in view of successful examples. Main target is the client of the audit.	Depending on the accuracy of the information these tools can also be considered and/or used as promotion support elements. These tools give clear message from the Administrator or the OA to the public
Audit guide or audit handbook, energy management handbook	
This tool explains and describes how an audit is to be made, how the calculations are to be conducted, the types and contents of the most frequently proposed energy conservation options (ECOs).	Core component of an energy audit scheme, the document is the basis of training sessions and is targeted essentially to auditors
Energy checks, Check-lists or walk through guides	
Associated to energy audit models of the scanning type, these supports are developed in order to facilitate the work of the auditor, assuring in the same time both quality and rapidity of the survey.	They can be used by energy managers for their own site or premises on a self auditing basis or more widely as a simple awareness raising instrument
Calculation methods and software	
Other core component of energy audit schemes, calculation methods and software are associated to energy audit models of the analysing type.	The use (by an auditor) of a recommended or certified (by the Operating Agent) calculation tool is an insurance of the quality on the results for the audit client. Developing software may become extremely expensive and time consuming for the Operating Agent.

EA Tools

Data collection form(s)

Generally associated to the calculation tool for which they constitute the input data, this type of support document helps the auditor in collecting all the necessary information for the survey.

It will be part of the final report and will also contribute to facilitating the follow up of the site energy features and the interpretation of the audit results and recommendations.

Report templates

The report is the deliverable of the audit, proposing a template helps all the participants to make the most profit of the audit service, produce similar audit reports and good audit quality.

They are over all depending on the energy audit models and, in many programmes are integrated in the audit model specifications. As for data collection forms, they are frequently associated with the calculation tool of which the output results must be integrated in the report.

Check list for quality control of audit reports

What is specified in the energy audit model, as expected results should be in the report: the checklist is an easy way to verify that the work has been done accordingly to the specifications.

Document to be used both at Operating Agent level and at auditor level (self-check), it is a complement or an alternative to report templates and a practical translation of Energy Audit Models

Building ratings, target values or benchmarking

Key figures that can be used either as marketing information to spark off the need for energy audits.

They are also used by the auditors as technical data to justify their recommendations in the case of simplified audits, and even can contribute to detailed audits in checking calculations or replacing data difficult to meter or evaluate either way.

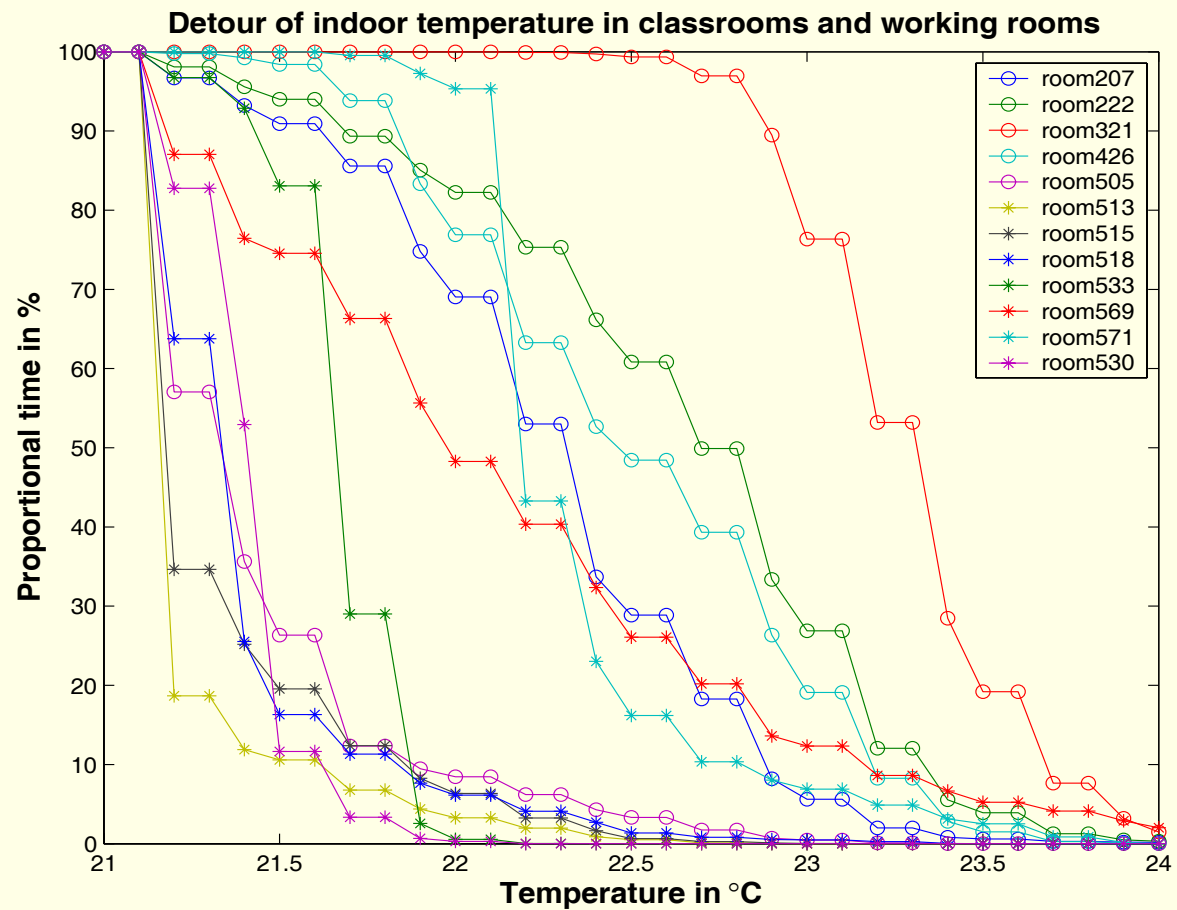
Data bases on energy conservation Options (ECOs)

Detailed information on costs and implementation side aspects or consequences of energy saving recommendations. A database of ECOs will save a lot of time and money to the auditor (and thus help lower the cost of the audits with a maintained quality).

Keeping the data up to date requires quite a lot of work from the OA.

1. Building s

1. Building s



Building Stock (Portfolio)

- Owner's Scope = Management
- Need for processed (filtered) Information
 - Energy
 - Economy
 - Environment
- Monitoring&Targeting (Yearly&Monthly Energy Data)
- Benchmarking (wasters, big consumers)
- Basis for Decision Making

Building

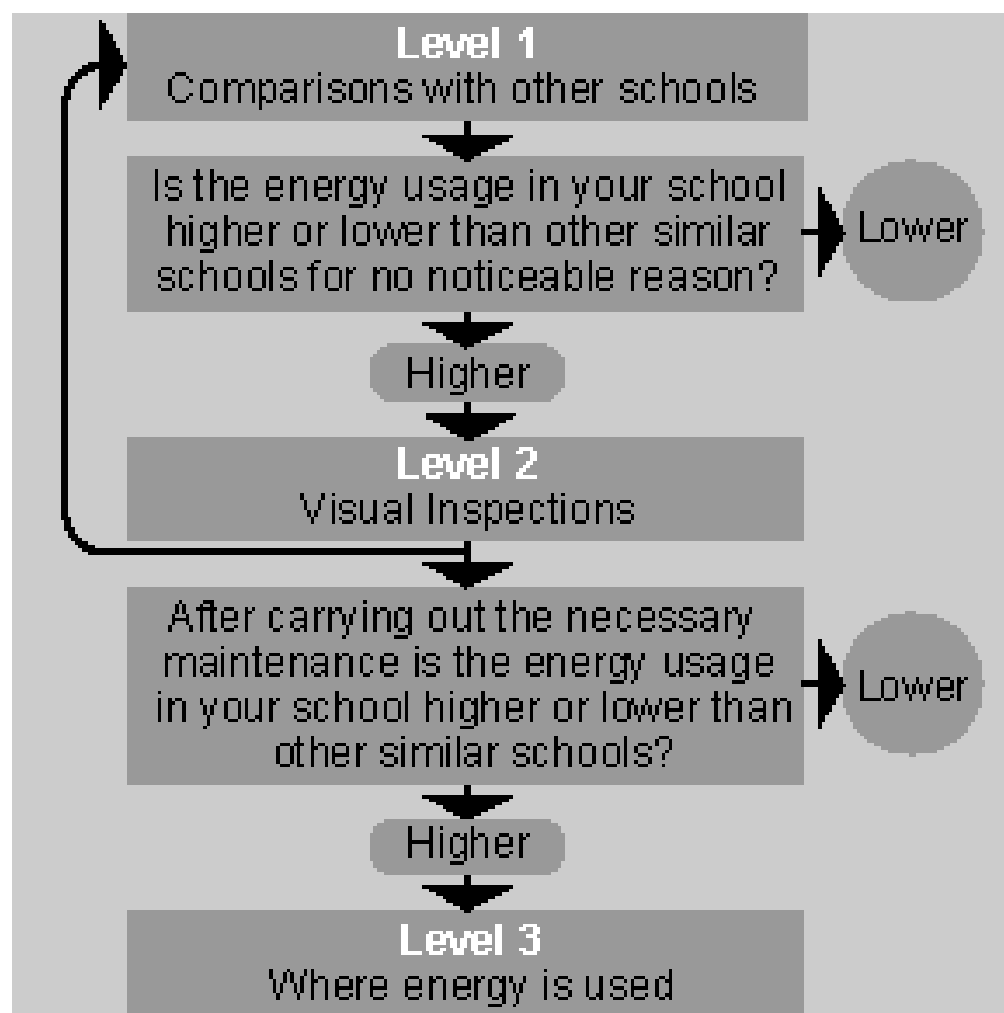
- User's Scope = IAQ, Thermal Comfort
- M&O personnel, activities essential
- Monitoring&Targeting (Monthly&Daily Energy Data)
- BEMS, M&O Manuals

Building Systems

- Envelope, HVAC, Lighting, etc. (look e.g. ASHRAE Guideline, The Commissioning Process)
- Monitoring&Process Control (Daily&Hourly Data)
- Energy
 - Economy
 - Environment
- Basis for Decision Making

Components, equipments

- Vendor's Scope = Management
- Specifications,
- Testing, balancing (TAB)
- Manuals etc. information



Annex36 - Microsoft Internet Explorer

File Back Links Address <http://www.annex36.com/> Go

++ Energy Concept Adviser Tool for public buildings now available for testing. +++ ++

IEA-ECBCS Annex36: Energy Concept Adviser - Microsoft Internet Explorer

File Back Links Address <http://www.annex36.com/eca/index.html> Go

REDUCE
Retrofitting in Educational Buildings

INTERNATIONAL ENERGY AGENCY
Energy Conservation in Buildings & Community Systems Programme

Start
Background and Goals
Content
Participants
Case Studies
Publications
Results
Energy Concept Adviser
Useful Links
Contact
Imprint

German Homepage of Annex
Homepage of International

ENERGY CONCEPT ADVISER
for Technical Retrofit Measures

country-specific data:












Internet

What is Motiva?

The logo for Motiva, featuring the word "Motiva" in white sans-serif font inside a red rounded rectangle.

- Established in 1993
- Motiva Oy is an impartial and **state-owned company** with 23 employees and annual turnover of 4 million €
- Motiva is a **service organisation promoting a market** for renewable energy sources and efficient energy use
- Motiva produces, **refines and disseminates information**, develops methods and boosts the introduction of advanced technology.
- Motiva **implements the government's decisions** on energy conservation and promotion of renewable energy sources.

Subsidy policy

- Energy Auditing is **voluntary**
- Following the **Audit Guidelines** given by Motiva and MTI entitles the client to apply for audit subsidies
- The subsidy is specified yearly
- In 2002 the subsidy is 40 % of the approved auditing costs
- Subsidies for energy saving investments are available for companies etc. in Voluntary Agreements

Motiva's tasks in EA-Programme

- **Overall co-ordination of the Audit Programme**
- **Promotion of energy auditing**
 - promotion material, website, presentations
- **Preparation of audit Guidelines with MTI**
- **Development of the Audit Programme**
- **Training and authorisation of auditors**
- **Quality control on auditors' work**
- **Monitoring of volumes and results**
- **Advice to auditors and clients**

A Walk-Through Energy Audit is a scanning model typically used in tertiary buildings where the energy consuming systems are quite simple and the probable areas for potential energy saving measures are known in advance.

A Preliminary Energy Audit is the scanning energy audit model for large sites in the process industry. Most of the work in the Preliminary Energy Audit is in building up a reliable breakdown of the present total energy consumption and in defining the areas of the significant energy consumption.

The audit points the most obvious savings and also points out the areas where supplementary “second-phase audits are needed and how they should be targeted

For the ***Selective Energy Audit*** the Operating Agent gives only general guidelines and therefore the auditor is allowed to choose the level of approach, both in coverage and accuracy. This audit model is very cost-effective, when used by neutral, target-oriented and experienced auditors but may also, in the worst case, concentrate on only the obvious savings and ignore everything else.

From the Operating Agent`s point of view this model is problematic because the quality control on this kind of audits is very difficult.

For the ***Targeted Energy Audit*** the Operating Agent defines clear specifications on the content of the audit. The audit may concentrate on one specific energy using system (boiler, compressed air system) or cover all energy use of the site.

There are various possibilities to create the technical content of a targeted audit. This model creates a basis for a standard and detailed reporting which brings some advantages to the Operating Agent especially in quality control and monitoring.

The targeted audits range from a One-system Audit to a Comprehensive Audit that covers all energy use.

The ***Comprehensive Energy Audit*** is one of the most typical applications of the Targeted audits. The Comprehensive audit covers all energy usage of the site, including mechanical and electrical systems, process supply systems, all energy using processes, etc.

Auditor's Tools

The wording "**tools for audits**" or "**auditors' tools**" describes a large family of support documents and applications which are intended to facilitate the work of auditors in the view of both minimising audit costs AND maximising audit quality.

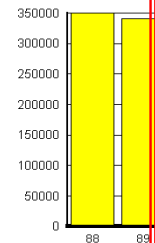
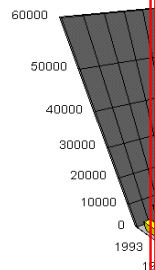
INDUSTRIAL ENERGY AUDIT RESOURCES

- ◆ Oregon Office of Energy - Industry Energy Auditing
<http://www.energy.state.or.us/industry/analysis.htm>
- ◆ Northwest Energy Efficiency Alliance - Technology Development
<http://www.nwalliance.org/>
- ◆ Energy Ideas Clearinghouse - Efficiency Information Resource
<http://www.energyideas.org/>
- ◆ U.S. Industrial Assessment Centers - Energy Audit Guides
http://oipea-www.rutgers.edu/documents/doc_f.html
- ◆ U.S. Environmental Protection Agency - Auditing Tools
<http://yosemite1.epa.gov/estar/business.nsf/>
- ◆ U.S Department of Energy - Best Practices Tools
<http://www.oit.doe.gov/industries.shtml>



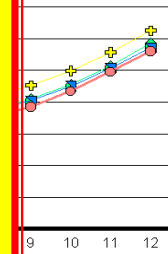
Data from Existing Utility Meters

Kumulati



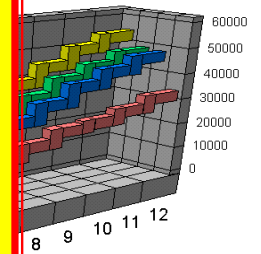
should be
utilised more
effectively !

Kumulutus (MWh)



OHJEKULUTUS

s (m3)



Benchmarking is an effective way

Specific Consumption of Energy in some Schools of Helsinki

Heating		(kWh/m ³)				Total cons. year 1999 (MWh)
Code	School	1996	1997	1998	1999	
HEL21187	Kontulan	81,1	83,1	89,4	82,2	.218
HEL21690	Pukinmäen	24,7	87,3	93,5	81,6	110
HEL21648	Pohjois-H	64,9	71,7	86,7	74,6	42
HEL21186	Pakilan y	44,7	62,3	66,4	61,8	.270
HEL21198	Vesalan y	52,6	53,8	54,3	57,5	.343
HEL21116	Kannelmäe	48,5	44,5	52,7	52,8	.105
						828
						.531
						454
HEL21143	Jakomäen	41,6	40,4	44,6	44,3	.211
HEL21055	Oulunkylä	45,3	45,3	54,8	43,9	828
HEL21185	Pakilan a	41,7	42,5	44,2	43,8	765
HEL21236	Käpylän y	35,5	38,0	39,3	38,5	.145
HEL21017	Vallilan	37,2	33,6	39,6	35,6	582
In average		47,2	49,1	57,4	50,6	

For Best Practice Dissemination!

WebE - Energylabeling concept © 2004 VTT - Microsoft Internet Explorer

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WebE FI | EN | SE

- ▶ [Frontpage](#)
- ▶ [Building and apartment register](#)
- ▶ [WebEtana](#)
- ▶ [WebKulu](#)
- ▶ [Consumptiondiagnostics](#)
- ▶ [Energy Labeling](#)
- ▶ [Info](#)

© 2004
VTT Rakennus- ja
yhdyksuntatekniikka

WebEtana

VUORIMIEHENTIE 5, Espoo

Building type

Heating system

Building location

Constr. year

Number of floors

Building volume

Laskennan lähtöarvot

☒ Laskenta suoritetaan yllä olevien tietojen perusteella

☐ Annan tarkempia tietoja rakennuksesta

Tulokset

☐ Energiatase taulukkona

☐ Energiatase kaaviokuvana

☐ Energiatase Sankey-diagrammina

☐ Energiatase piirakkadiagrammina

☐ Kuukausittaiset kulutukset

Laske Peruuta

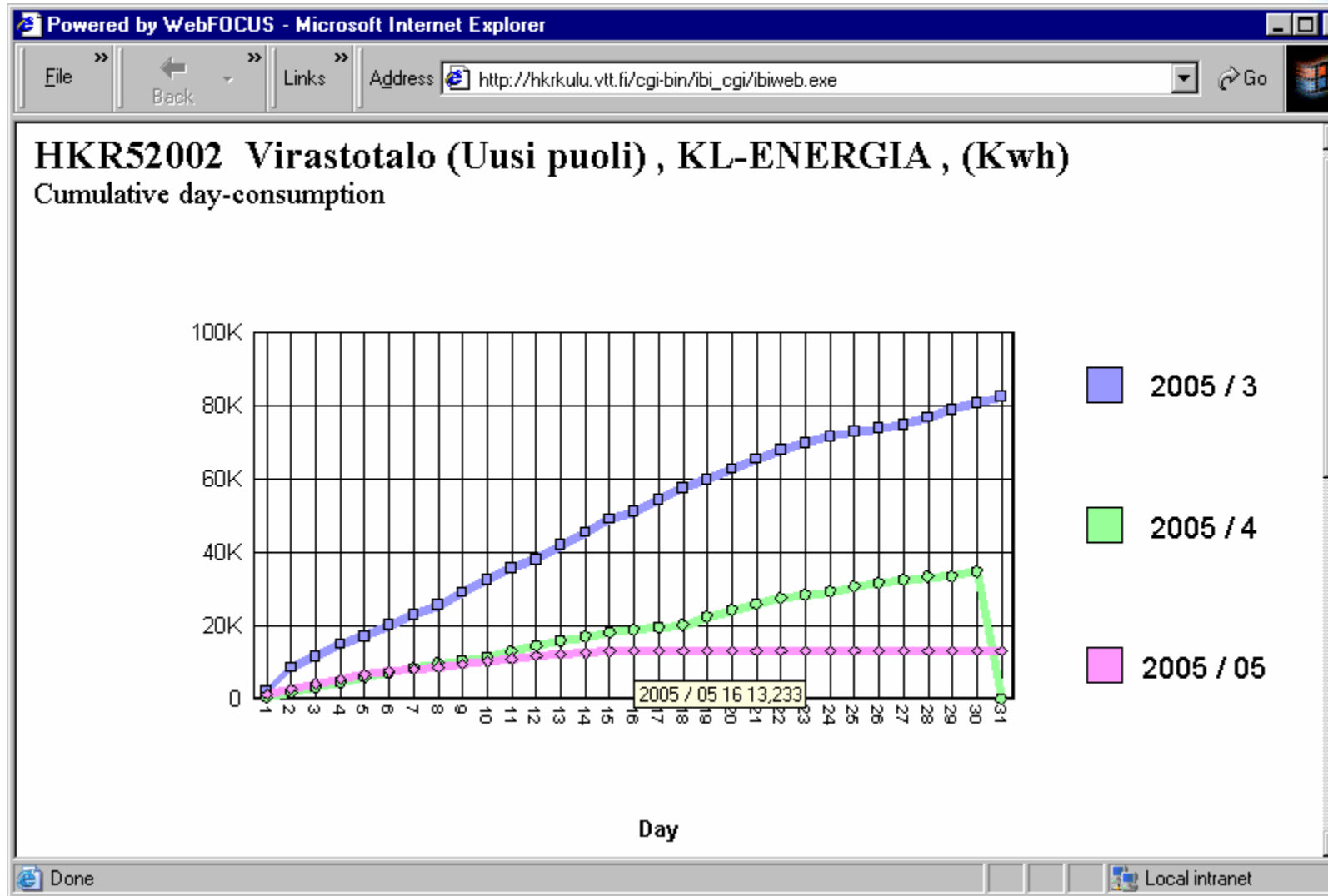
Vuotuinen kulutusarvio

Lämmitys	1337 MWh
Sähkö	665 MWh

Done Local intranet

Energy consumption estimate calculation with WebEtana

- Energy calculation needs very few input parameters. More data for the calculation is generated from the system's default value database according to the year built, type of the building, type of the heating system, total room area, and geographical location.
- it is possible to adjust and define the calculation parameters if needed
- the results can be displayed in charts etc.
- the result can be exported to an energy consumption monitoring module
- Easy, simple, fast, and accurate enough



Information Dissemination

Tähän esim. Motivan esimerkki-kortit ja ulkolaisia aineistoja (ks. EnergySavingInfo/UK)

1. Monitoring & Targeting,

- data collection sw-tools
- AMR-over internet
- cons. statistics, analyses

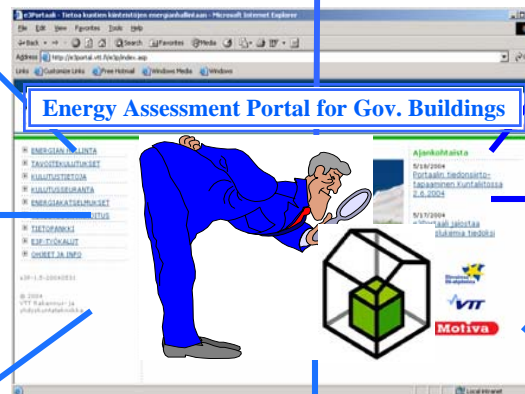
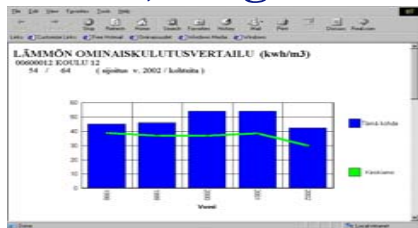
0. General Information

- Background
- Motivation
- Partners, Actors
- Links to other sites

7. Realisation, financing

- Risk management
- Escos, EPC's etc.
- M&V (Commissioning)
- eBusiness-framework

2. Benchmarking, control, diagnostics

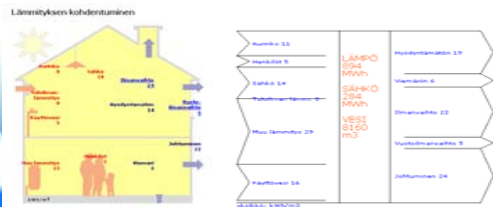


6. Energy Concept Adviser

- saving technologies
- product information
- companies, services
- best practice info

3. Calculation tools

- WebEtana, RET etc.



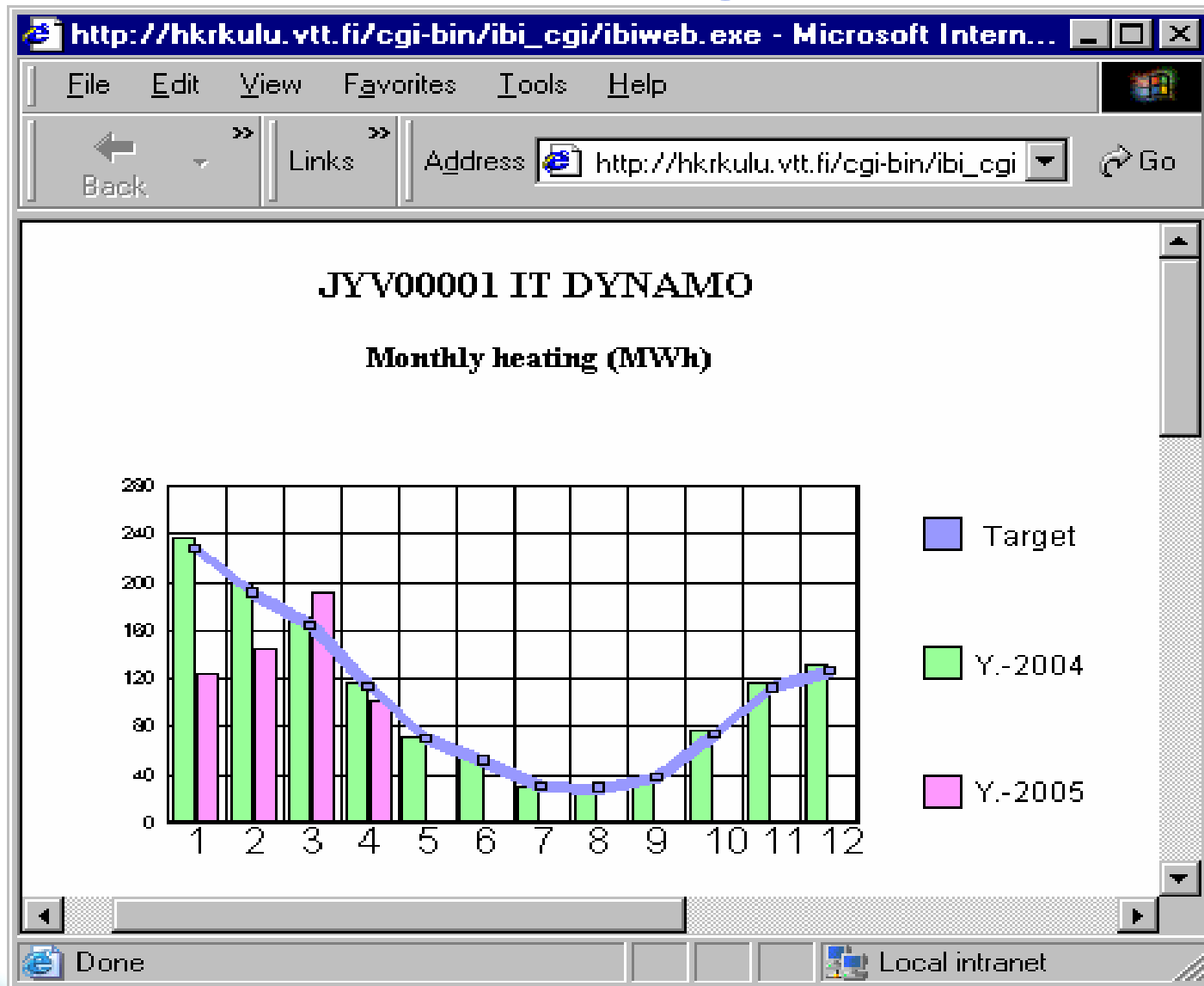
4. Energy Auditing

- general guidelines
- best-case examples
- sw-tools (Motiwatti)
- paybacks etc.

5. Envelope & IAQ performance evaluation

- Thermal scanning
- Air-tightness
- Other measurements

EA on Building Level:

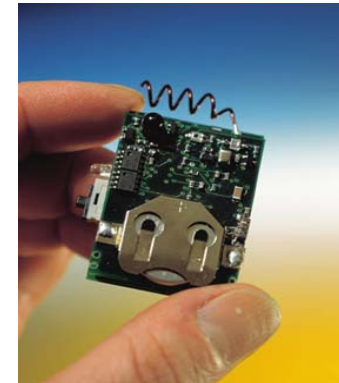


Demonstration of new technologies?

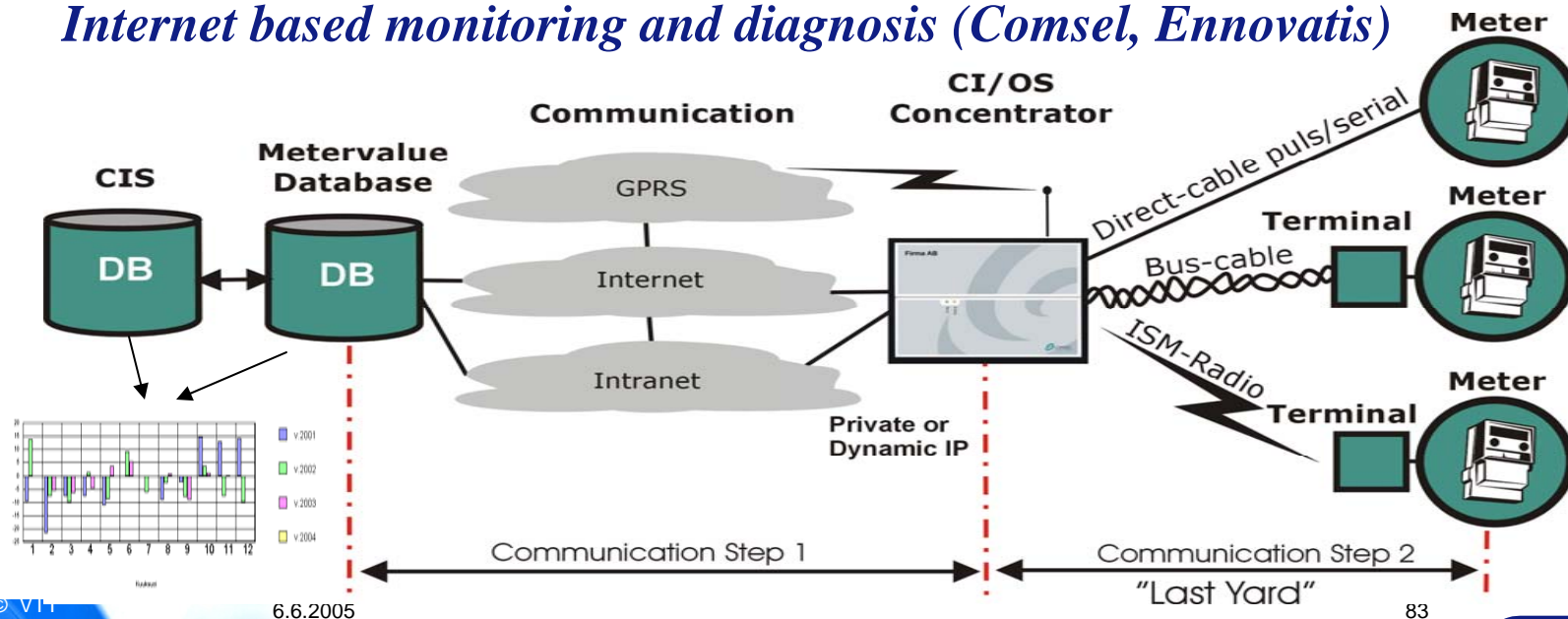
SoapBox (VTTELE)

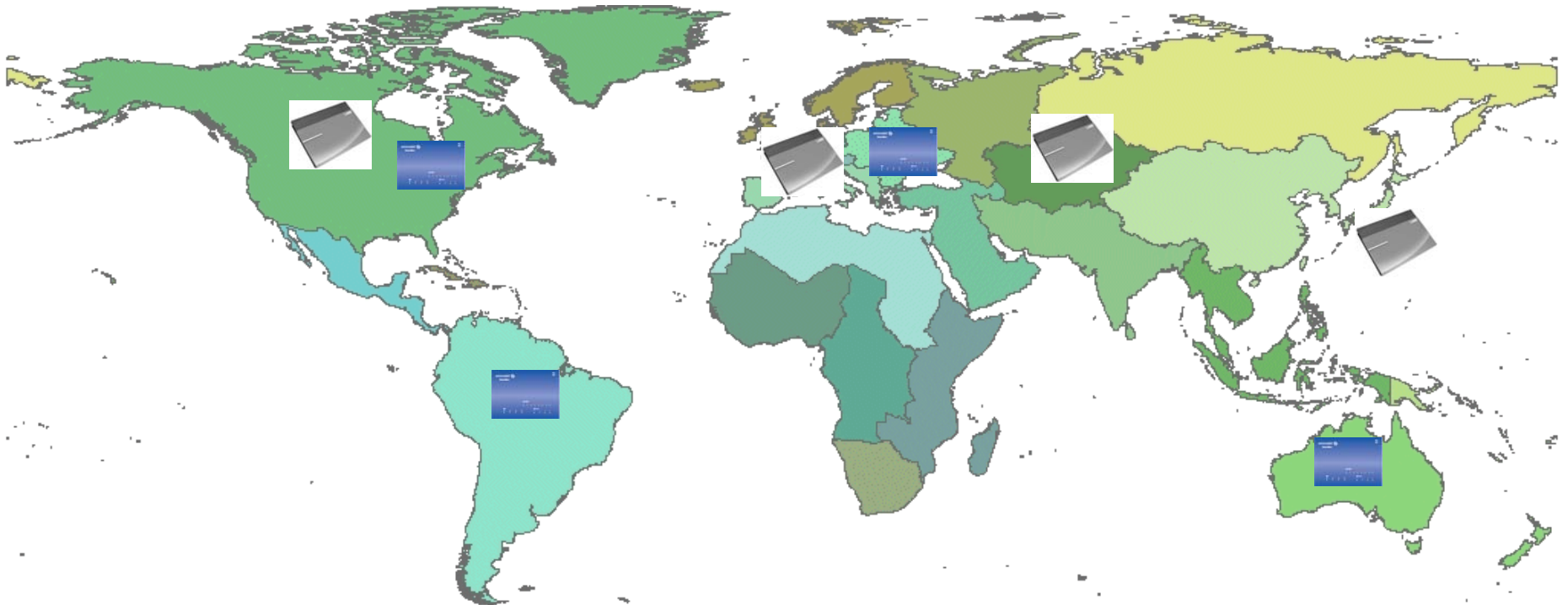
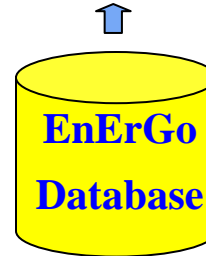


LUQAS-Smart Sensor (EnSan, GER)

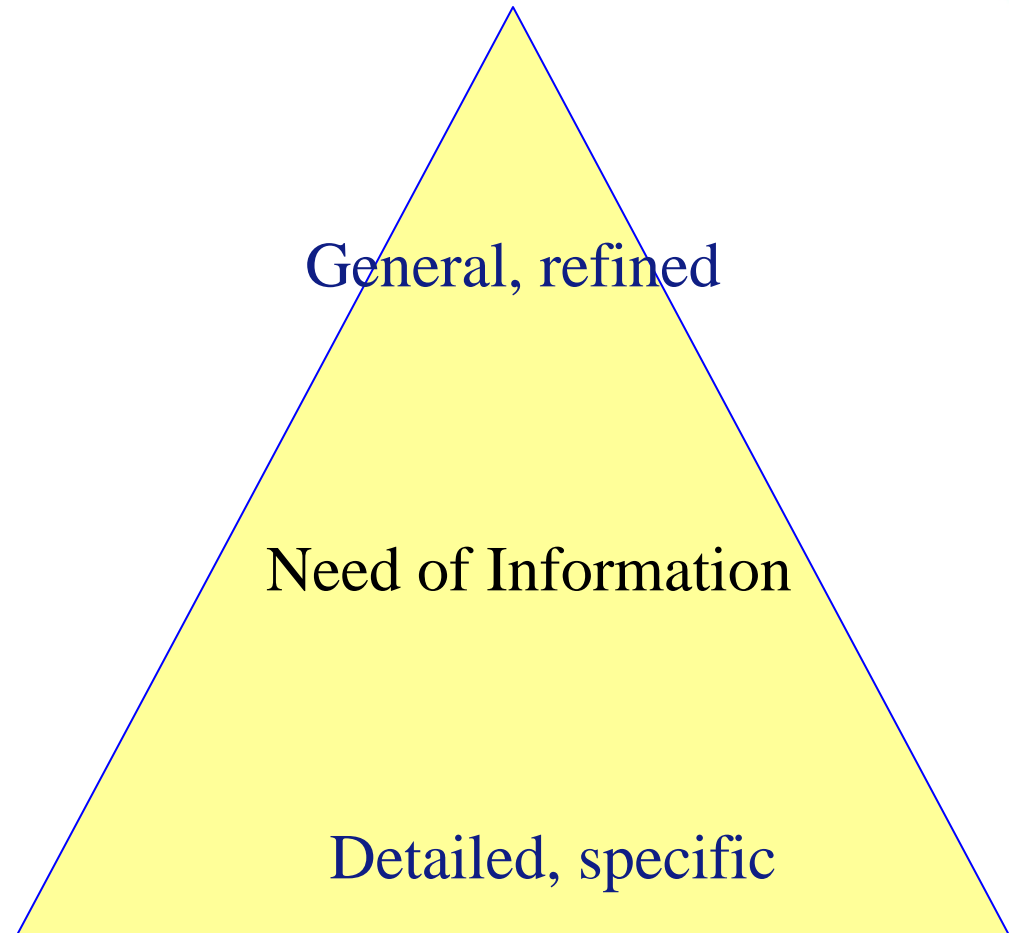
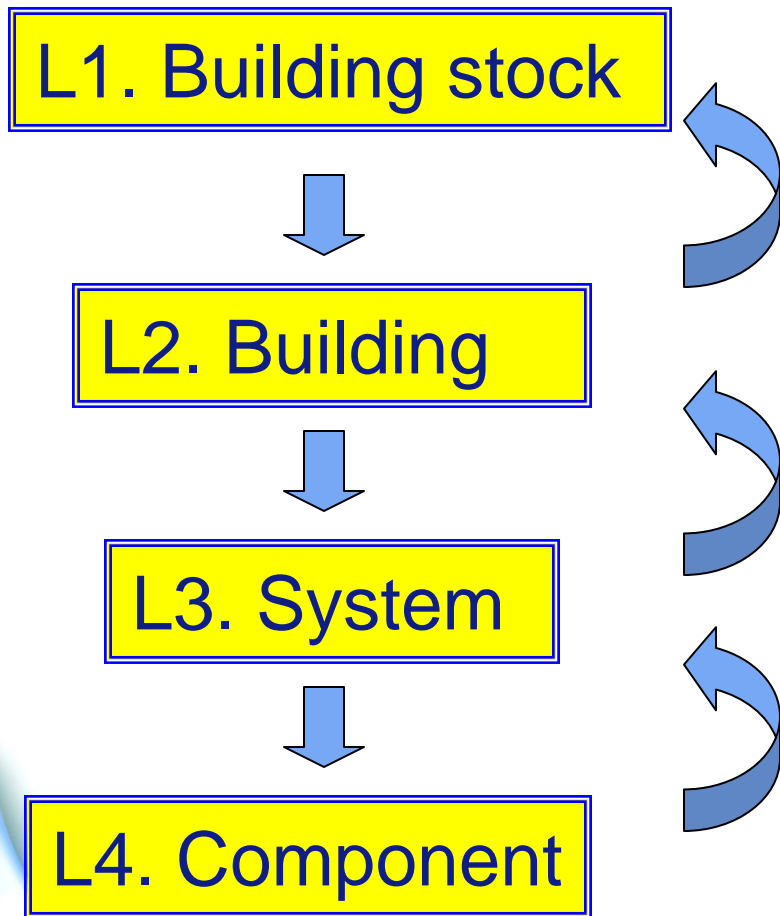


Internet based monitoring and diagnosis (Comsel, Ennovatis)





Tools of assessment:



Energy Management Strategies

